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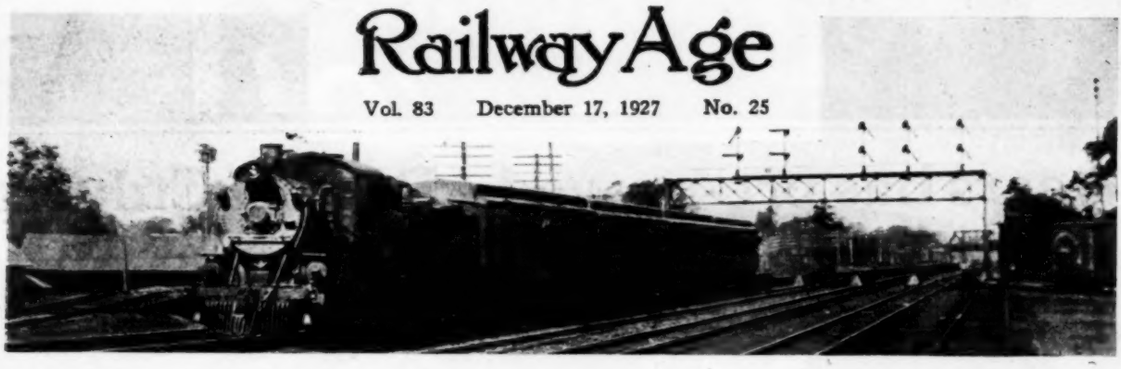

A Jersey Central Suburban Train at Roselle, N. J.

Contents

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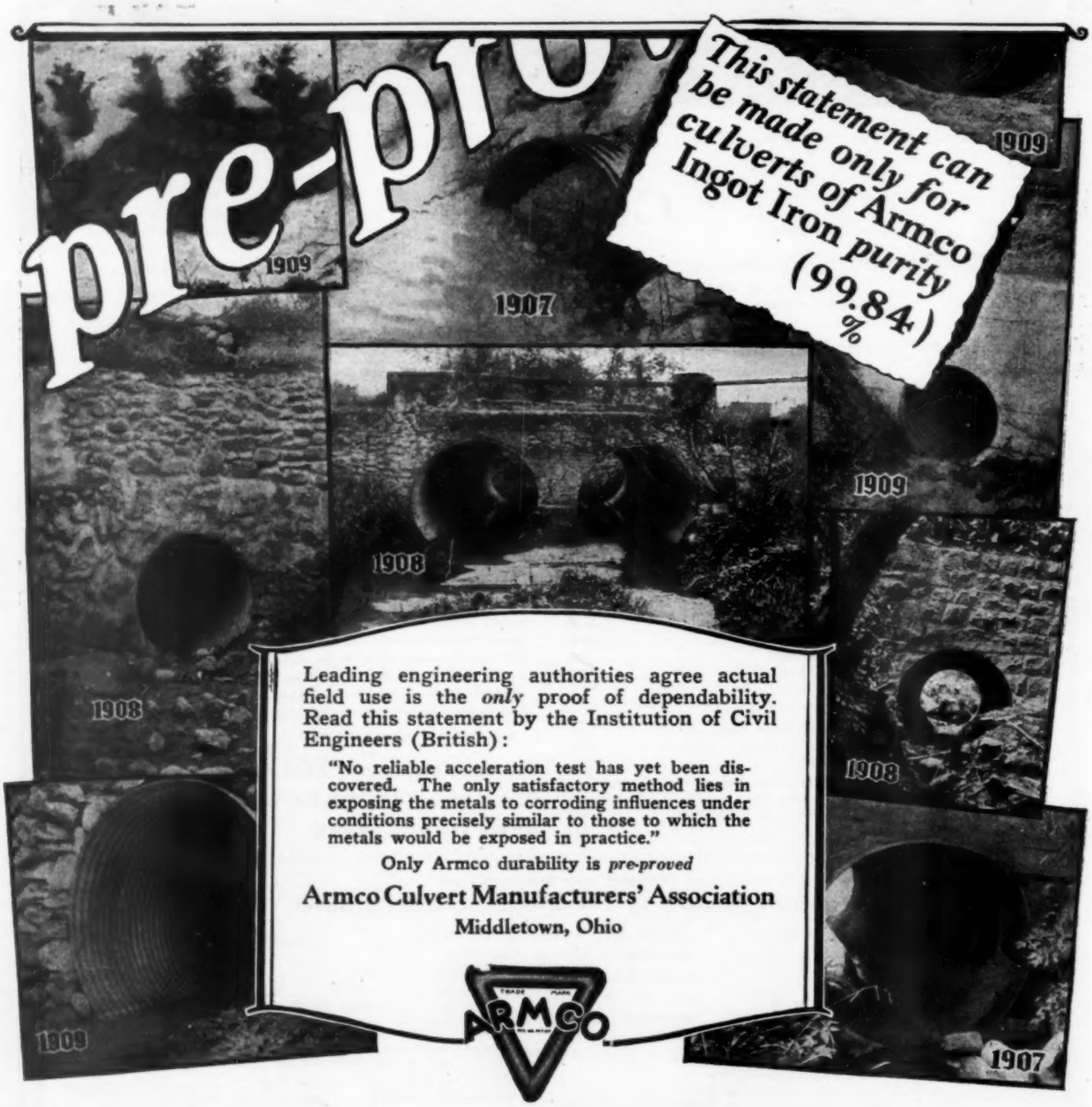

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Railway Age

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The Court Decision in the O'Fallon Case

APPARENTLY no court decision definitely and comprehensively setting forth the way in which the Interstate Commerce Commission should make valuations of the railroads will be rendered until the question of confiscation is so clearly presented that the court must pass on it. The opinion of the United States district court in the O'Fallon case, which it decided last week, does not seem to show that the question of confiscation actually was not presented, but the court held that it was not, and, therefore, declined to decide whether the commission's valuation of the O'Fallon is legal or not. In consequence, the decision, which was anticipated with much interest, is really of little importance. The case will, of course, be appealed to the Supreme court, which may hold that, in order to decide how much of the earnings of a railway may be recaptured, there must be a determination of the legality of the valuation on which computations to ascertain the percentages of return earned are based. There have been two decisions in which federal courts have held that valuations made by the commission were unsound, and which have been reversed by the Supreme court upon the ground that the issue of confiscation was not directly presented. Now, in a third case, another federal court decides against a railway for the same reason. Sooner or later, however, the major issues involved in valuation will get before the Supreme court in such a form that it will have to pass on them.

A Consideration for Signaling Overlooked

AMONG the advantages to train operation accruing from the installation of automatic block signals is one consideration that has been overlooked in many cases. This is the fact that with automatic signals, freight trains can frequently be dispatched from yards when ready, because added track capacity is available without delaying departure to allow as much spacing between trains on the road as was required with manual block or train orders. Likewise with automatic signals, trains are not required to clear the main track at passing sidings for as long a period as without such protection. After a train is called, the time lost before departure enters into the road time so far as operating costs, such as wages, fuel, etc., are concerned, and this lost time frequently results in overtime. In making a study of train operation on a division of the Atchison, Topeka & Santa Fe, where automatic signals were proposed, the train sheets showed few delays on the road that could be eliminated by signals. However, further investigation showed that trains were being held in yards until they could be dispatched without interference with other trains and that with the signaling system proposed, these yard delays could be reduced. Time lost in the yard counts as well as delays on the road.

A Dangerous Practice

IT is generally recognized as a dangerous practice to pound or in any way to disturb a locomotive boiler washout plug when subjected to high steam pressure. A violation of this tenet was recently observed in a passenger terminal. A fireman with a coal pick was on the ground standing directly in front of a washout plug which he was pounding in an effort to stop a leak. If, by chance, the soft threads of the bronze plug had been crossed with the hard steel threads of the throat sheet, the conditions would have been ideal for a serious accident. The results would have been that the offending fireman would have received the full effects of the escaping steam and water and in addition, many of the passing passengers would have been severely scalded. It is true that such a practice is uncommon. The fact that it occasionally occurs, however, indicates that either the engine crews are not always properly instructed as to dangerous practices of this kind, or that they have become negligent and careless through lack of sufficient supervision.

Central Vermont Receivership

ANNOUNCEMENT was made on Monday that the Central Vermont had been placed in receivership as a result of its severe losses in the Vermont floods. Receivers were appointed on the petition of the Canadian National, which owns two-thirds of the company's stock, is the largest creditor and which guarantees its bonds. The Central Vermont, however important it has been as a part of the Canadian National's traffic routes to New York and Boston, has not been prosperous. It has reported a deficit in each of the past several years and even in its best year since the war, 1926, it earned only 82 per cent of its fixed charges. In 1925 it earned only 43 per cent of its charges and in 1923 only seven per cent. It thus appears that had it not been for the support of the Canadian National, and of the Grand Trunk previously, the road might have been in receivership some time ago. That the receivership should come at this particular time, however, emphasizes the road's ill luck. Up to the first week of November, when the flood badly damaged some 100 miles or one-fifth of its track and many of its bridges, the Central Vermont was reporting much improved earnings this year. Its net operating income for the first 10 months was $1,131,000, as compared with $881,000 in the same period of 1926. The Central Vermont is one of only two Class 1 railroads that have suffered the adversity of receivership during the past two years. Both receiverships occurred in 1927 and

both occurred on account of floods, the Missouri & North Arkansas receivership in May resulting from floods in the Mississippi valley.

Women in Yard Offices

IT is not so many years since clerical work in a yard office was, to say the least, undesirable. Yard clerks were frequently tough citizens, and their surroundings did nothing to soften them. The class of clerks attracted to such yard offices was low and, as a result, costly errors were frequent. Some years ago, a yardmaster on the Canadian Pacific at Winnipeg hit upon the idea of employing a woman as a clerk in his office and actually hired one and put her to work. When the general officers heard of it, they watched the experiment with interest. The success of the scheme is indicated by the fact that, about a year later, general instructions were issued to employ at least one female clerk in each yard office. The results have been gratifying. The entire air of the yard offices has been changed from unsavory places where only the least desirable clerks could be induced to work, to clean, attractive, well-run offices where the highest type of clerical labor, male and female, may be recruited. Not the least of the benefits has been the noticeable decrease in the number of errors made by the new and more efficient clerical force now employed.

Preventing Rough Handling

FOLLOWING out the idea expressed in editorials appearing in the *Railway Age* of July 23 and September 3, the joint meeting of the Southeastern, Eastern and Virginia claim conferences was attended by a number of superintendents, at which time a committee of superintendents was appointed for the purpose of organizing the superintendents nationally in a drive against rough handling. This committee is now functioning and its work should be watched with interest by all railways. The problem of eliminating rough handling is an important one and if a satisfactory reduction in damage from this cause is to be made, the superintendents must co-operate with the claim department. One railway, at least, has adopted an effective means of enlisting the superintendents' co-operation by allocating the loss and damage payments according to divisions and furnishing the superintendents and trainmasters of each division with periodical statements of the amounts chargeable to their divisions. This has the effect of impressing upon them a sense of responsibility for these losses and gives them an added incentive to work in harmony with the claim department toward the common end of reducing the irritating and largely unnecessary losses arising from rough handling.

New Developments in Communication

AN interesting trend in recent installations of telegraph and telephone facilities on the railroads is the incorporation of the newest developments in equipment designed to increase the capacity of the plant, such as telegraph printers, carrier current apparatus and vacuum tube telephone repeaters for long distance lines. The introduction of printers on one large system has reduced the time of handling the telegraph file from six to eight hours, for under Morse operation this road required 18 to 24 hours to move the message file over its transcontinental line, while the present printer installation handles it in from 12 to 16 hours at a reduced operating cost. Again a Canadian road operating a commercial telegraph service in addition to its telegraph and telephone service for train operation, has made two installations of the carrier current system to increase the capacity of its present wires after finding that a ten-channel carrier system, operating over a distance of 334 miles, and a six-channel carrier system, working a distance of 1,309 miles, were more economical than the erection of additional wires. Telephone repeater stations on a western road have made it possible to operate a long distance line satisfactorily over a circuit embracing about 3,000 wire-miles. An eastern road has completed an experimental installation of radio for directing hump engines at a yard, where printers and loud speaking telephones are also employed in order to speed up operation. All of this development is designed to expedite the communication service, either by increasing the message capacity or by extending telephone service over longer lines. Such a tendency is encouraging for it points the way to better operation of all railway facilities.

The Valuation Decision And The Press

ONCE more the railways have failed in their efforts to obtain a judicial review of the Interstate Commerce Commission's valuation methods, but the public does not know it. Those who receive their information on such matters from the public press have now been informed on three or four occasions that the commission's methods have been "sustained" or even "approved" by the courts, because the Supreme Court on three or four occasions, and now the special three-judge court at St. Louis that passed on the O'Fallon recapture case, have not yet found it necessary to consider the merits of the valuation controversy. In the O'Fallon case the court finds it unnecessary to examine and determine the various contentions concerning the proper method of ascertaining value on the ground that the O'Fallon company, selected by the commission for a test case, has earned a fair return even on its own claimed valuation, after deducting the amount of its excess earnings which the commission ordered it to give up, so that "the verity of the commission's valuation herein need not be examined and cannot affect this recapture order." Yet the public is informed by most of the newspapers published on December 11 that the court had sustained the commission's "prudent investment" basis, as against a cost of reproduction basis of valuation, under such headlines as "Rail Values Cut $11,000,000,000 by Court Ruling." Similar headlines were used when the Supreme Court ordered railway petitions dismissed on the ground that the valuation orders had not yet reached the proper stage for consideration by the courts, or had not yet been used in such a way as to warrant a judicial review. If the Supreme Court does not consider the use by the commission of tentative valuations in rate and other cases as sufficient cause for interesting itself in the commission's methods of ascertaining value, it would perhaps be too much to expect the courts to do so for the purpose of preventing reckless newspaper headlines.

However, a possible basis on which the Supreme Court might render a different kind of a decision in the

O'Fallon case, is suggested by the opinion of Judge Faris, who concurs in the result but believes that the court should inquire into the method of valuation. He himself takes the position that the commission has done the best it could and has not erred, but he also says that if its valuation is too low its order confiscates some of the property of the railroad, regardless of what it leaves it.

Draft Gear Straws Indicate Trend

A FEW straws which indicate the trend of opinion of railroad men regarding present draft gear conditions are as follows: A car department superintendent says, "The proper maintenance of draft gears should be considered as important as keeping the air brake in operative condition. . . . . It is my firm conviction that the car department cannot spend money in any better way than in close supervision of the draft gear situation, as a large number of defective and damaged cars are due to defective draft gears." A master car builder says, "The need of an energetic, thoughtfully directed campaign on this phase of equipment maintenance is everywhere evident." A mechanical department head writes, "I believe that in order to maintain draft gears in efficient operating condition, a periodic maintenance program for such gears will eventually be established." Another correspondent advises, "There is only one way to improve draft gear conditions and that is to make the owners inspect these gears at stated intervals. If this is done, then watch the cost of maintenance of freight equipment and damage to lading decrease." There are practical difficulties of a most serious nature which will have to be met in any program involving the general dropping and removal of freight car draft gears at stated periods for inspection and repair. Less serious difficulties stand in the way of periodic inspection, and at least one large railroad is taking a step in the right direction by inspecting draft gears whenever air brake work is done, dropping those gears evidently defective, repairing or replacing them and stenciling the date and place on the end of the car. It is anticipated that by this means draft gears on practically all the car equipment on this road will be inspected once every two years. Operating officers have a responsibility in this connection not only for the easier handling of cars at terminals and on the road, but in backing up their mechanical officers in their attempt to secure better draft gear conditions, which will also substantially reduce damage to car equipment and lading.

Association of Advertising Agents Deserves Support

THE American Association of Railway Advertising Agents, which was organized less than four years ago but which has already established a foundation of good work upon which to build a successful future, deserves the support of all the railways. Its next annual meeting, to be held in Chicago on January 17, should be well attended. The advertising departments of the railways need a clearing house of experience just as much as do the other departments of the railways. The railways are spending more and more money each year for advertising. As these expenditures grow, the responsibility of the advertising agents and their need of a thorough knowledge of what experience in railway advertising has shown are increased correspondingly. Consisting as they do of discussions of the various forms of railway advertising and of their effectiveness or lack of effectiveness, the meetings of the advertising agents' association are of inestimable benefit to those in attendance who have the expenditure of money for advertising in their charge. Through the meetings a spirit of cooperation between the railways in different parts of the country is developed, the logical effect of which should be the stimulation of the travel urge of the people of this country, with consequent heavier passenger business for all the lines. Railway advertising for freight traffic in newspapers and magazines of a popular nature is still something of a novelty, and is restricted to a small number of railways, but it is a subject to which the advertising agents are giving careful attention. Railway advertising is in a period of development, and the indications are that the future will see more railway advertising and more effective railway advertising. The American Association of Railway Advertising Agents will doubtless be a principal factor in the anticipated progress in railway advertising. All roads which do any advertising can well afford to be represented at its meetings.

Motor Transport Problems to the Fore

WITH the organization, scheduled for Chicago in January, of the new Motor Transport Division of the American Railway Association there promises to begin a more effective study of a problem which is of importance to almost every department of the railroad. The new division will have three sections—one for highway motor coaches, one for trucks and one for rail motor cars. There is no doubt that greater use of these methods of transportation—not indiscriminately, but in such cases where careful study shows they can serve—will effect great savings for the railroads. The new division, by facilitating the exchange of experience among the railroads ought to aid in the dissemination of impartial, scientific information on the subject. Should a highway motor coach or a rail motor car be used to take the place of an unremunerative train? What field is there for the motor truck in certain classes of light maintenance work? Of how many men should a rail motor car crew consist? In just how many ways can a truck be used profitably to improve freight service? What value has the motor coach as a traffic builder for train service? Is there a field for the motor coach in the transportation of employees, substituting for shop trains? If a railroad has motor vehicles, what methods should it use in operating, maintaining and accounting for them? Such questions as these need full and free discussion and finding the correct answers to them is of importance to almost every railroad department. The new division has much work to do and in it deserves the support of every railroad. Meantime, the Interstate Commerce Commission is about to issue an examiner's report on proposed motor vehicle legislation, on which oral arguments will be heard on January 16. The formation of a recognized association of railroad officers who are familiar with motor transport problems has not come too soon.

Enormous Increase of The Commission's Work

THE enormous increase that has occurred, and is still occurring, in the extent, variety and detail of regulation of the railways by the Interstate Commerce Commission, and in the work that it is imposing upon the commission and its organization, on the railways and their organizations, and also on representatives of the shipping public, are strikingly indicated by statements made by Chairman John J. Esch in a recent address before the American Short Line Railroad Association. Mr. Esch remarked that in the seven years since he became a member of the commission its output of published volumes of decisions has been as great as it was in the entire preceding 33 years, and will this year amount to about 16 volumes averaging 750 pages each.

When this statement is statistically elaborated it becomes positively monumental. In the approximately 33 years of federal regulation which ended on March 1, 1920, when the railways were returned to private operation, the commission rendered decisions which filled 56 volumes. They occupied about 42,000 printed pages containing approximately 20,370,000 words. The number of volumes of decisions published from that time to and including November, 1926, was 60, which brought the total number up to 116, containing approximately 87,000 pages and 42,195,000 words. If we understand Mr. Esch correctly, the 16 volumes of decisions for 1927 will increase the total volumes to 132, the number of printed pages to about 99,000, and the number of words in them to about 48,015,000.

Reducing these figures to an annual basis, the decisions of the commission in the first 33 years of its existence filled yearly an average of 1,273 printed pages containing about 617,000 words. During the last 7 years the annual averages have been 8,143 pages and 3,949,000 words. The opinions rendered in 1927 will occupy about 12,000 pages and contain about 5,820,000 words. The annual averages of pages and words during the last 7 years have been 540 per cent greater than the annual averages for the preceding 33 years, while measured in pages and words the output in 1927 will be 438 per cent greater than the average for the preceding 39 years and 843 per cent greater, or more than nine times as great, as prior to 1920.

The commission now administers 28 separate acts of Congress and its organization has grown in 40 years from 5 commissioners and 30 employees to 11 commissioners and about 1,900 employees, approximately one-half of whom are in the field and one-half in Washington. The commission, in spite of the great increase in its output of decisions, has not been able to keep abreast of the inflow of new cases, and has 2,800 cases pending, although in the past year it has handled 1,546 formal proceedings.

Why have there been these enormous increases in the work of the commission during the last 7 years? They have been due mainly to new provisions of law and resolutions passed by Congress. When the Transportation Act was passed the commission already was engaged in the gigantic work of making a valuation of all the railways. The Transportation Act imposed on it important new duties, including those of settling the government's accounts with the carriers for the six months' guaranty period from March 1 to September 1, 1920, the regulation and issuance of all securities issued and the determination of what consolidations of railways should be encouraged and authorized. A few years afterward Congress passed the Hoch-Smith resolution requiring it, in effect, to make an investigation and readjustment of the entire freight rate structure of the country, especially for the benefit of agriculture. As a result of this and other legislation, of proceedings instituted by railways and shippers and of proceedings instituted by the commission on its own initiative, it has undertaken an amount of important work far exceeding that ever undertaken by any other government body. The number of commissioners has been increased, but developments have made it necessary for the commissioners to delegate more and more of their work to bureaus, as a result of which regulation has passed more and more out of the hands of the commissioners into those of its employees.

The facts given strikingly illustrate how, once regulation of an industry has been begun by the government, it tends to increase until it threatens to swamp both those charged with the regulation of the industry and those charged with its management. The wisest thing Congress could do during its present session and some sessions to come would be to refrain from loading any more work on the commission, and thus give it opportunity to complete the numerous herculean tasks in the performance of which it is already engaged.

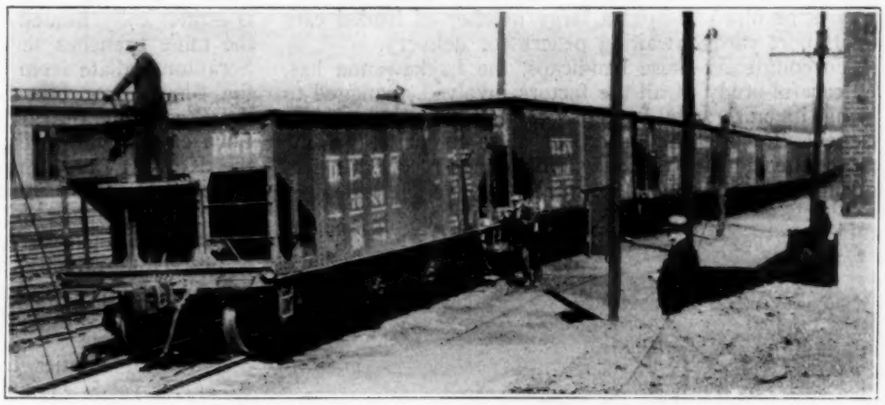
Technically Trained Men

THE question of the use of college trained men by the railroads will not down. The railroads have been quite seriously criticized because they do not show the same activity in sending scouts each year to the colleges to sign up the most promising graduates. Equally strong is the criticism to the effect that they do not scientifically plan to assimilate these men in their organizations and that they do not especially favor them. Some of the leading engineering educators declare that they cannot consistently, on the basis of experience and observation, advise graduates to seek positions in the railway field or to accept them if offered. Numerous attempts have been made to bring different groups of engineering educators together with practical railroad officers for a frank discussion of these matters. Apparently very little has come from these conferences, except that possibly both groups are getting a little better appreciation of the difficulties involved in coming to some mutually agreeable understanding.

Meanwhile, there are certain tendencies, which while not directly connected with this problem, promise to have a large effect upon its final solution. In the first place, the officers on a number of railroads, and particularly in the mechanical department, are giving more attention to the selection of recruits, and more than one shop superintendent is proud of the fact that only high school graduates are given consideration as apprentices. The various conferences of the younger railroad men and the extensive organization of A. R. E. B. clubs is doing much to focus attention upon the problem of helping the young men find their proper places in the organization and to encourage them in improving themselves and making the best use of their opportunities. Then, too, the organization of supervisors' clubs and foremanship training classes on many roads is helping to bring up the standards of supervision and to direct attention to better training not only of the apprentices, but of all of the workers in the organization, regardless of their length of time in service. All of these factors are helping to raise the standards and to focus greater and greater attention upon the best selection, the best placement and the best use of each employee. There are not a few who believe that these things will tend to encourage the railroads to make a larger use of college trained men in all departments.

Lackawanna Handles Anthracite Traffic Skillfully

Efficient car utilization obtained despite physical handicaps and complexity of operations



Loaded Coal Cars Going Over the Hump at Hampton Yard, Scranton, Pa.

AN average of 1,000 cars of anthracite coal is hauled out of Scranton, Pa., daily by the Delaware, Lackawanna & Western, with a total ownership of somewhat less than 12,000 cars suitable for coal loading. This performance is all the more notable when account is taken of the many conditions that make efficient operation difficult.

Numerous handicaps surround practically every feature of the operation. The unfortunate labor situation in the anthracite industry is well known and the sporadic general, district and local strikes of the miners, have resulted in wide variations in the amount of traffic produced by the mines, with attendant difficulties of operation for the railway. The whole course of the movement in recent years has been a succession of dull and peak periods, following each other rapidly and with little if any warning.

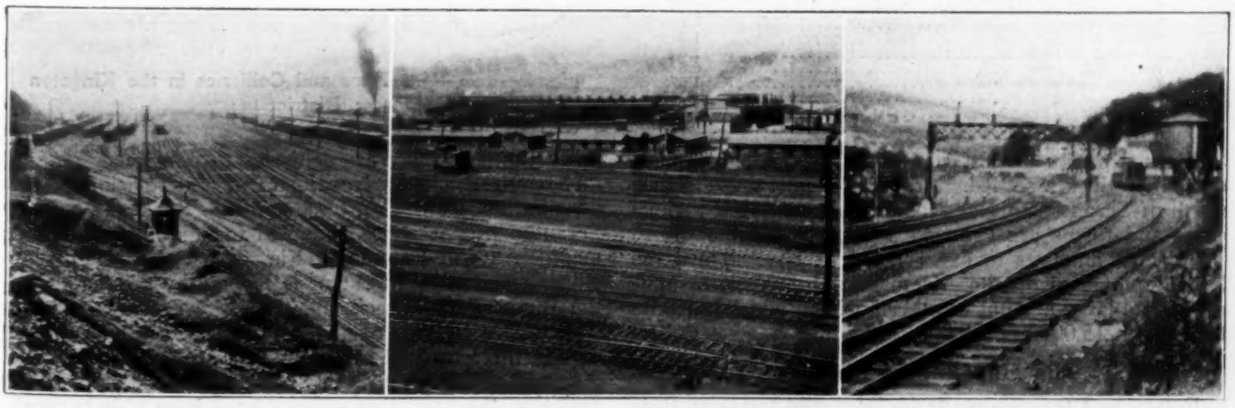
Mountainous Country Handicaps Operations

The physical handicaps have also tended to render operations highly complex, even when the movement is relatively normal. The Wyoming and the Lackawanna valleys, from which the D. L. & W. draws its anthracite traffic, are completely hemmed in by rugged mountains. The coal from these districts is brought to Scranton over various branches for concentration and movement east and west, from there over the main line.

In the city of Scranton, the railway is at an elevation of 740 ft. above sea level. Westward, the main line rises for eight miles abruptly to an elevation of 1,242 ft. at Clark's Summit, on an average grade of 1.5 per cent, and a maximum of 1.56 per cent. An even longer climb must be contended with eastward where the line climbs to an elevation of 1,970 ft. at Gouldsboro, 20 miles, on a grade of approximately 1.4 per cent, with a maximum of 1.51 per cent.

The Bloomsburg branch, extending from Northumberland, Pa., to Scranton taps the heart of the anthracite district and is the source of much coal. Its grade line is also broken, particularly in the vicinity of Scranton, with nearly 1 per cent grades against loaded movement in many places between Kingston, Pa., and Scranton. A number of mine branches radiate from this line in the vicinity of Kingston, on the majority of which steep grades are encountered, since the breakers where the coal is loaded, are usually situated some distance up the side of the mountain. In some cases, it is impossible to push more than seven empty cars up these branches at one time. One of the principal traffic-producing branches out of Kingston, serves the Loomis, Auchincloss, Bliss and Truesdale mines. For a considerable distance, this branch has a 3 per cent grade against the empty movement.

The propensity of coal jobbers to hold cars in the ports for long periods is another deterrent to efficient car utilization. Depending upon the state of the market,



Where Anthracite Is Handled: Left, Hampton Classification Yard; Center, Receiving Yard and Engine Terminal at Hampton; Right, the Main Line and the Winton Branch at Nay Aug, Pa.

retail coal dealers demand a large variety of sizes and grades of coal and, in order to supply this demand, the jobbers must keep a supply of practically all sizes and grades on hand at all times. The result is that the railway is required to hold a large number of loaded cars in its port yards, awaiting orders for delivery.

To counteract these handicaps, the Lackawanna has, by careful study of all the factors involved, managed to bring its anthracite handling to a high point of efficiency. Despite the unsettled labor conditions in the anthracite industry this year, which have resulted in frequent shutting down of the mines, the average miles per

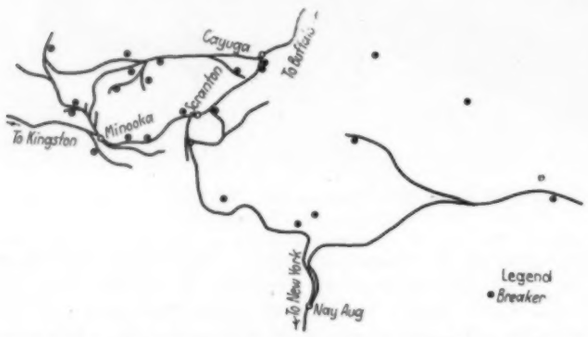


Fig. 1.—The Lackawanna's Main Line and Branches in the Scranton District

open-top car per day for the first eight months were 22.3. During May and June, when the output was fairly normal, the miles per open-top car per day averaged 26.4 and 26.1, while the total open-top mileage was 8,296,230 miles and 7,647,047 miles respectively.

Where the Coal Originates

The Lackawanna serves some 35 collieries in the Scranton and Kingston districts, of which about half are owned by the Glen Alden Coal Co. The main line and a network of branches in the immediate vicinity of Scranton serve some 18 collieries, while 17 are served by the mine branches radiating from the Bloomsburg branch in the vicinity of Kingston. Figure 1 illustrates the lines operated by the Lackawanna in the Scranton district and Figure 2 in the Kingston district, while the following table gives the mileages of the mine branches:

	Miles
Winton Branch	7.4
Hanover & Newport Branch	11.46
Keyser Valley Branch	4.8
Panccast Branch	3.03
Sibley Branch	0.9
Holden, Taylor & Old Pyne Branches	2.6
Continental, Archbald & Pyne Branches	2.56
National Branch	0.7
Storrs Branch	1.0
Diamond Branch	1.8
Steel Mill Spur	0.8
Central and Sloan Branches	1.07
Pettebone Branch	1.15
Green Ridge Branch	1.2
Brisbin Branch	0.07

The anthracite district served by the Lackawanna is extremely thickly settled. From a considerable distance north of Scranton to Nanticoke and beyond, the various cities and towns are grouped so closely together as to form what amounts to one continuous city. Thus, the handling of coal on the Bloomsburg branch is complicated by a large amount of other business which amounts to between 15,000 and 20,000 cars a month.

The Handling of Empties

Empty coal cars are made up into solid trains at Buffalo on the West and in the concentration yard at Secaucus, N. J., four miles west of Hoboken. The trains from the West are brought into Taylor yard, leaving the main line at the west end of Scranton yard at a point known as Hyde Park "Y," shown in Fig. 3. Taylor yard is used exclusively for the handling of empties and is strategically located for that purpose, since many of the mine branches serving collieries in the vicinity of Scranton radiate from it; it is also at the junction with the Bloomsburg branch. Ordinarily, all empties from the West come directly into Taylor yard in solid trains. Such empties, however, as are intended for loading on the Keyser Valley branch, which runs from Cayuga, through Hampton yard to Taylor yard, as shown in Fig. 3, are run off the main line at Cayuga and taken down this branch to be spotted at the collieries, instead of proceeding directly to Taylor yard. These movements are so designed as to avoid using the busy stretch of track in the vicinity of the passenger station and the locomotive shops.

Trains of empties from the East also move directly to Taylor yard, leaving the main line at the same point as the empty trains from the West. A regular daily movement of coal comes from collieries on the Winton branch, which leaves the main line at Nay Aug, five miles east of Scranton. Empty cars for loading at these collieries are, therefore, cut off at Nay Aug from empty trains from the east, there being a small yard at Nay Aug for that purpose. If, as is sometimes the case, the movement of empties from the West is insufficient to supply the needs of the Keyser Valley branch, trains from the East are run by Taylor yard without stopping and over the Keyser Valley branch into the Hampton receiving yard. The large number of empty coal cars required to serve the collieries on the Bloomsburg branch are taken to Kingston and distributed from there.

The entire scheme of distributing the empty cars has to be arranged on a flexible basis, to permit meeting the fluctuating demands of the various collieries. One colliery that has been requiring a large number of empties daily may suddenly shut down; another that has been dormant for some time may begin loading feverishly with equal suddenness, and this may be multiplied as

Fig. 2.—The Mine Runs and Collieries in the Kingston District

many times as there are collieries to be served. All of this requires constant readjustment and revision of the distribution plan. Fortunately, the track lay-out in Scranton proper is well adapted to flexibility of movement. As will be seen in Fig. 2, what is roughly an ellipse some miles in extent is formed by the main line, the Bloomsburg branch and the Keyser Valley branch. This ellipse consists of at least double track everywhere and is three-tracked and four-tracked for considerable distances. By careful study of the possibilities of these facilities, the operating officers have been able to work out a series of operations to cover practically every conceivable contingency resulting from the vagaries of the

coal business. Moreover, these operations are so arranged as to avoid back-hauls of empties or loads and other expensive and inefficient practices. These facilities were expensive to build, as the territory traversed is extremely unfavorable to railway construction, but the resulting increase in operating efficiency has amply justified the expenditures made.

Bloomsburg Branch Operations

The normal output of the collieries on the Bloomsburg branch, all of which are situated in the Kingston district, is 550 to 650 cars per day, with a high day of 745 cars. This branch is double-track for 24 miles from Scranton to Nanticoke, the southern end of the anthracite district served by the Lackawanna, and is single track for the remainder of the distance to Northumberland, 56 miles. In addition to handling a heavy freight business, other than coal, five passenger trains are operated daily in each direction between Scranton and Kingston and four in each direction daily from Kingston to Northumberland.

A general yardmaster with several assistants controls operations in the Kingston district, his jurisdiction extending over the mine branches as well as the yards. Two flat yards are provided in this district, one at Kingston and one at Hanover, the latter serving principally the mine branch to four large collieries on the east side of the Susquehanna river. Kingston yard consists of 16 tracks, with a total capacity of 472 cars, with five 6-wheel switching locomotives taking care of the yard work. Hanover yard consists of 7 tracks, with a total capacity of 510 cars. The collieries in the Kingston district are served by 13 mine runs operating out of Kingston, the mine run crews also doing all of the necessary switching at Hanover, and handling an employees' service train twice daily. Consolidation locomotives are used exclusively on the mine runs.

Eight road crews operate between Kingston and Scranton, heavy Mikado locomotives with boosters being used on these runs. The first run in the morning consists of one locomotive pulling approximately 2,400 tons, usually consisting of a solid train from Woodward, a colliery situated directly on the Bloomsburg branch, between Kingston and Hanover. During the remainder of the day, the locomotives are double-headed on each run and approximately 5,000 tons per train are handled. After delivering the loads at Hampton Yard these crews proceed to Taylor yard, and pick up a train of empties to take back to Kingston. The various movements of these crews in the Scranton terminal are explained in more detail later.

Mine Run Operations

When the empties arrive, they are distributed at Kingston and Hanover yards, in accordance with the requirements of the collieries in the Kingston district at the moment. The mine runs then distribute the cars to the mines. Night runs are operated to provide a supply of empties for early morning loading. In a number of cases the operation is seriously handicapped by physical conditions. On one branch for example, which serves four mines with a normal output of 250 cars per day, only 25 empty cars can be pulled up the sharp grade to the mine at one time. At the Loomis mine, where as many as 150 cars per day are loaded, there is track room for only 45 empties and 45 loads. The cost of constructing additional tracks is prohibitive, since the mine is perched on the side of a mountain. Under these circumstances, it is necessary to make a large number of runs to and fro daily. The entire situation is one which, if not carefully supervised, will result in a great deal of lost motion. However, by long experience and careful supervision, the best methods of solving each of these problems has been worked out individually.

When the empties arrive at the mine they are placed on tracks above the breaker. Car handlers employed by the mines drop the cars into place under the loading chutes by gravity, and, after the cars are loaded, the brakes are again released, and they are dropped onto the loaded tracks below the breaker.

Most of the mines are equipped with breakers. In

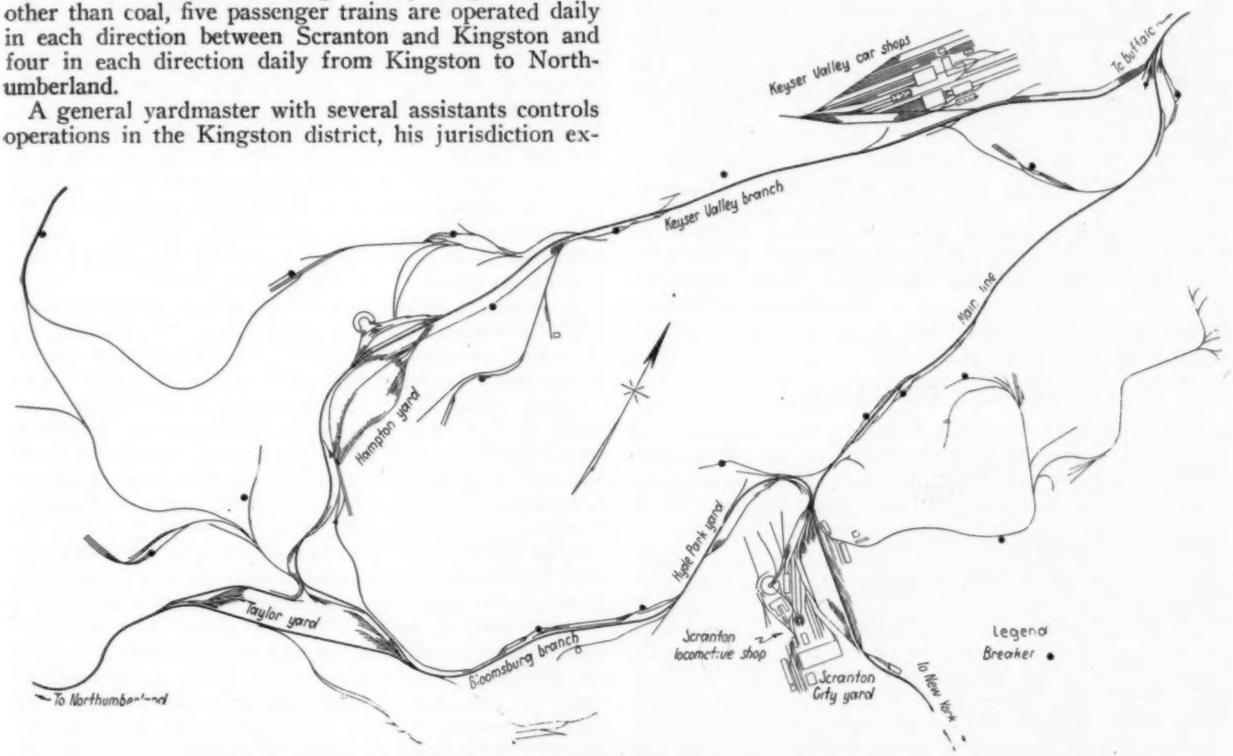


Fig. 3.—The Operating Lay-Out of the Lackawanna in the Vicinity of Scranton

one or two cases, however, the coal, as it is mined, is transported to a shaft that has a breaker. This is true at the Auchincloss mine for example, the coal being hauled to the Loomis breaker over the railway's tracks. This movement, however, is entirely under the jurisdiction of the mining companies and the railway crews do not enter these tracks except to make one run daily to deliver commercial freight and supplies to the mine. This joint operation extends over somewhat more than three miles of single track and is protected by a staff system.

In addition to open-top cars, coal is loaded in box cars at some of the breakers, which are equipped with box-car loading machines. The practice of loading coal in box cars is growing with shipments that are destined to distant points, as it protects the coal from pilferage while enroute. The box-car coal loading machines consist of a semi-circular movable cradle on which the track is laid. The box car is spotted on this cradle, under the loading chute, which is inserted through the door. The cradle is then tipped back and forth by means of an electrically-driven motor, so that the coal is evenly distributed to all parts of the car. A line is drawn in all box cars used in this service, showing the height of loading at which the capacity of the car is reached, and capacity loading is assured. Although a box car may be loaded with coal in this manner in a few minutes, there is no sudden rush of coal to either end of the car at any time. Car repair officers on the Lackawanna have not found any cars damaged by reason of this method of loading, although about 125 box cars a day are loaded in this manner in the district.

Handling Loaded Cars

After the cars leave the breaker, they are run over track scales, and the weights are taken for billing purposes by a joint weighing inspector. After leaving the scale, they are dropped into the departure tracks. A certain amount of classification is done at this time, depending upon the number of tracks available. In every case, the cars are divided as betwen eastbound and westbound coal, or coal intended for storage at one of the huge storage piles maintained in the vicinity of Kingston. If only one breaker is served on the branch, one mine-run crew takes the loaded cars into Hanover or Kingston yard, as the case may be, after spotting the empties. If, as in the case of the Loomis-Auchincloss-Bliss-Truesdale mine branch, more than one breaker is served and the traffic is sufficient to require it, four or five mine-run crews sometimes operate on one branch. The first crew up in the morning remains in the vicinity of the breakers for the rest of the day, distributing empties and bringing loads to a siding, where they are picked up by the other crews and taken into the yard, the other crews being employed entirely in bringing empties to and taking loads from the concentration point. In this manner, the difficulties of restricting grades are overcome to a large extent since the second crew can make a number of trips during the day, bringing up the maximum train of empties on each trip.

Ordinarily, coal that is intended for movement eastbound from Scranton is assembled at Kingston yard and westbound coal at Hanover. Eastbound cars are given a thorough inspection at Kingston, sufficient to take them through to tidewater without an additional inspection enroute. These trains are then run to Scranton and delivered to main line crews at a small interchange yard known as Hyde Park yard, just off the main line.

These trains are not broken up at Scranton, running through from Kingston to Secaucus, N. J., except that certain trains pick up cars in the Nay Aug yard, five miles east of Scranton. These cars are loaded on the Winton branch, which is served by mine-run crews operating out of Nay Aug yard. All cars are classified in the Secaucus yard and distributed to the various coal piers from that point. After delivering their trains at Hyde Park yard, the Bloomsburg branch crews return to Taylor yard to pick up trains of empties, as previously described.

All cars for movement westbound from Scranton are assembled at Hanover. No attempt is made at classification and the cars are merely given a running inspection. Trains leaving Hanover proceed directly to the receiving yard at Hampton, 20 miles, where they are broken up and classified. Leaving Hampton light, the Bloomsburg branch crews proceed to Taylor yard for a train of empties for the return movement to Hanover.

Hampton Yard Operations

With a heavy movement of freight, other than coal, much of it moving in manifest trains, it was found expedient to segregate the coal traffic as much as possible. This idea has been carried out in the Scranton yard plan. Taylor yard, previously explained, is intended primarily for the handling of empty cars. Similarly, Hampton yard is principally used for the handling of loaded coal cars. As will be seen from Fig. 3 both yards are off the main line, and both are conveniently located to serve both the Bloomsburg branch and the breakers in the Scranton district.

In addition to the coal brought into Hampton from the Bloomsburg branch, it also receives the coal from the Scranton district, the mine-run crews in that district operating from the Hampton receiving yard. The methods used in distributing empties and picking up loads by the mine-runs out of Hampton are similar to those used in the Kingston district, except that the amount of coal produced in the Scranton district is somewhat less and the physical handicaps in serving the breakers are not so great.

The facilities at Hampton consist of a receiving yard and two gravity classification yards served by the same hump. The eastbound classification yard consists of 15 tracks, with a capacity of 765 cars; the westbound classification yard also has 15 tracks, with a capacity of 973 cars. Three of the tracks in the westbound yard hold 97 cars each. These tracks are adjacent to and readily accessible from the main tracks and are used largely for handling eastbound freight trains that are not to be humped.

Because of the rugged terrain, it was necessary to build the receiving yard on a descending grade of 1.3 per cent toward the hump. This necessitates the use of hand brakes on the trains being pushed to the hump A switchman is sent over the train being humped to apply the hand brakes sufficiently to retard the movement of the train. It has been found that the application of brakes on every twelfth car throughout the train gives sufficient braking power to counteract the grade. The average train pushed over the hump consists of 60 loaded cars. A 3.5 grade extends for 200 ft. from the summit of the hump, the next 200 ft. is on a 2.0 per cent grade and the remainder of the classification yards is on a 0.5 per cent grade.

The switches are manually operated, each switchtender manipulating five switches. A three-position signal is situated at the base of the hump, and another in the center of the receiving yard. These are operated by air and controlled by push buttons from the summit of the hump. An air whistle is also used in conjunction with the signals to control the movement of trains over the hump in foggy or stormy weather.

The yardmaster is advised in advance of all business en route to the yard, so that he may assign his forces accordingly. Only one eight hour shift is operated and the number of car riders depends largely upon the amount of business to be handled. An average of 23 car riders is employed, who make well over 25 rides per shift. An electric trolley is used to bring the riders back from the classification yard to the hump. Classifications are unusually numerous, and the number of cars per cut is correspondingly low, having averaged only 1.22 for the first eight months of this year. During June, 1927, for example, 18,955 cars were humped, and it was necessary to make 15,950 cuts.

Pusher Service

Because of the heavy grades out of Scranton in both directions, a comprehensive pusher service must be maintained, there being 35 engine crews in the pusher pool. Two pusher engines are used on coal trains westbound from Hampton Yard to Clark's Summit, each pusher engine in this service making three or four trips per day. Two pushers are employed eastbound from Scranton to Nay Aug, 5 miles, and one from Nay Aug to Lehigh, the latter point being 18 miles from Scranton. A wye is provided at Lehigh on which the pusher locomotives may turn, in order to avoid running backward for the long distance down the mountain into Scranton. The helper locomotives in this service make two trips, one trip to Lehigh and one trip to Nay Aug per day.

The heaviest grade is between Scranton and Nay Aug. As a matter of fact, tonnage is added at Nay Aug, which is the terminus of the Winton branch. A small yard consisting of six tracks with a total capacity of 130 cars is situated at this point. The mines served are 14 miles from Nay Aug. Nevertheless, the mine-run crews handling the Nay Aug job, take in a train of empties, arriving at the breakers as late as 11 a. m. and the same cars are delivered loaded at Nay Aug to be placed in through coal trains the same day.

Operations up the hill on the main line in both directions are facilitated by the use of three tracks, the third one being used primarily for slow freights, although here too a flexibility of operation is maintained, and, upon occasion, the third track is used for manifest trains as well.

Car Repair Shops Aid

The maximum car utilization is aided materially by the large and modern Keyser Valley car repair shops at Scranton. The location of the shops in the heart of the coal-producing territory renders long hauls of empty bad-order cars unnecssary and repaired cars may be put in revenue service at once, also without the necessity of long empty hauls. The average daily production of these shops is 10 steel cars requiring general repairs.

A general superintendent has headquarters at Scranton, and he is assisted in supervising the coal operations by a superintendent, three trainmasters and a terminal trainmaster. General yardmasters are stationed at both Scranton and Kingston, with a corps of yardmasters in charge of the various yards. It is significant that all of these men began their railway careers in Scranton and its immediate vicinity. The complexities involved in handling the coal are such as to require a life-time knowledge of the business in order to supervise it efficiently.

Similarly, practically all of the employees are local men. The carhandlers employed at the mines give the railways an excellent source from which the draw at least partially experienced men at all times for train or yard service.

Prices of Wheat Little Affected by Freight Rates

FREIGHT rates do not to any marked degree affect prices received by the farmer for wheat, according to a study just completed by the Bureau of Railway Economics as to the relationship of wheat prices to transportation costs. The bulletin covers primarily the 1926-1927 wheat crop. The information regarding prices paid to farmers was obtained from country elevators, shippers or farmers at representative origin points throughout the principal wheat producing sections of the United States.

"It is sometimes assumed," says the bulletin issued by the bureau, "that freight rates to primary markets have a definite effect upon local farm prices. Under this general assumption, the price to farmers at points more distant from market (measured in terms of freight rates) would be lower than the price at nearer points, the difference in price being definitely attributable to the difference in freight charge. Thus, at a point having a freight rate of 15 cents to primary market, the farm price might be expected to be 5 cents lower than at a point with a freight rate of only 10 cents.

"The rates and prices shown in this bulletin do not support this assumption. There appears to be no definite relation between prices paid to farmers and freight rates to primary markets.

"In the first place, at points having the same freight rates to a primary market, the prices paid to farmers not only differed considerably but showed no uniformity even in their differences.

"Secondly, farm prices at points with longer hauls and higher freight rates to market were often higher than at points from which the freight rate to market was lower and the haul was shorter.

"Thirdly, although in many cases higher farm prices were paid at points near to market than at points more distant in terms of freight rates, the difference in price seemed to have no computable relation to the difference in freight rate."

While the United States is the largest producer of wheat in the world, it is relatively the smallest exporter among the great wheat producing nations, according to the bulletin. "The amount of wheat and flour in equivalent wheat retained for home use in the United States during the four crop years 1922 to 1925 averaged nearly 77 per cent of the crop as compared with some 26 per cent in Canada, 31 per cent in Argentina and 34 per cent in Australia."

In respect to some of the marketing factors which enter into production and sale of wheat, the bulletin points out that "dockage" in wheat always affects the price to the farmer. Dockage includes all foreign material that can be separated from the wheat by appropriate cleaning devices.

"Dockage not only decreases," according to the bulletin, "the prices paid to the farmer and increases the handling charges at the elevators, but causes the unnecessary use of many railroad cars. It has been estimated that during the years 1923 to 1925, an annual average of over 34 million bushels of dockage was included in the estimated wheat production. Had all of this been transported by rail, it would have unnecessarily required more than 26,500 cars annually. The Department of Agriculture estimates that spring wheat farmers who clean their market wheat gain more than 5 cents per bushel as a result of cleaning."

Illinois Central Suburban Service

*A summary of records covering the first year of electric operation in the Chicago district**

By W. M. Vandersluis
Electrical Engineer, Illinois Central Railroad

ON July 21, 1856, the Illinois Central started suburban service in Chicago by running four trains each way between down-town Chicago and Hyde Park. This service was gradually extended until, in July of 1926, there were in regular operation on each normal week day, a total of 398 trains with service extended to Matteson on the south, to South

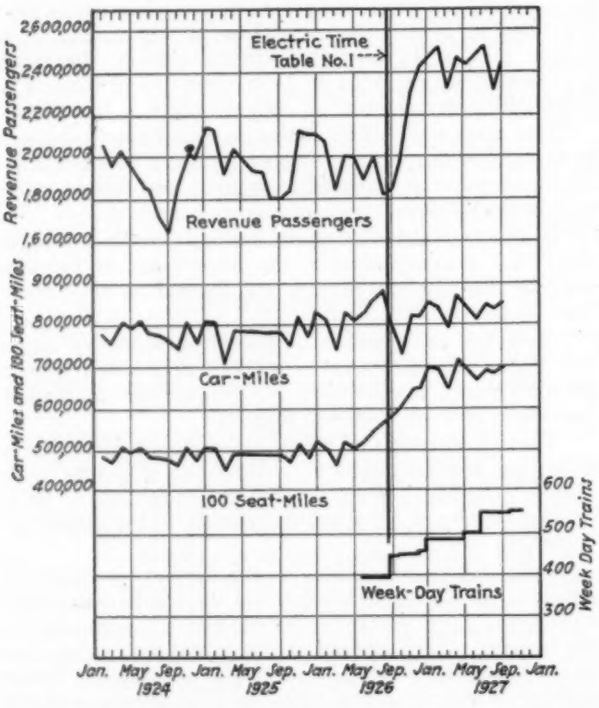


Fig. 1—Operating Curves Showing Traffic Before and After Starting Electric Operation

Chicago on the South Chicago Branch, and to Blue Island on the Blue Island Branch. In the year 1925, this steam service carried a total of 24,000,000 paid passengers. Approximately 285 coaches, mostly of wood construction and with an average seating capacity of 56 persons, were used in this service. About 60 locomotives were necessary for the daily operation.

Electric Operation

Electric operation for the suburban service has been agitated for years by various civic bodies, and the first formal report on feasibility and costs was made in November, 1909. This was followed by several other investigations and reports, but the railroad did not agree to the project until the passage of the so-called Lake Front Ordinance in 1919. This provided that the suburban service should be completely electrified by February 20, 1927.

On July 21, 1926, exactly 70 years after the first steam service was started, three electric trains were operated each way in the local service between Randolph Street and Hyde Park. The electric service was started seven months before the time called for in the Lake Front Ordinance. The second week 80 trains were operated each day and in the period of about five weeks the electric service was built up to a total of over 350 trains.

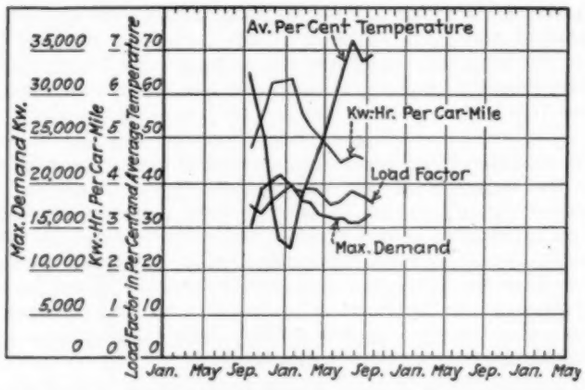


Fig. 2.—Curves Showing Monthly Operating Records With Electric Service

These were all operated, of course, on the existing steam time-table, as there was still a considerable number of steam trains in the service.

The first electric time-table was put into effect on August 28, with a total of 396 revenue trains. Because of a shortage of new equipment it was still necessary to run six trains by steam, but these were confined so far as possible to those carrying shop employees. Today, 470 revenue trains are being operated on a normal week-day. In addition there are 14 equipment trains and 72 Chicago, South Shore and South Bend trains, the latter being operated between Kensington and Randolph Street. This is a total of 556 electric trains. Electric service was put into effect without any serious accidents or interruptions and has so continued during the first year.

Due to the fact that all of the motor-trailer car units are uniform in design and in operating characteristics, the preparation of time-tables and the handling of equipment at terminal points has been greatly simplified. Fig. 1 shows by months the revenue passengers carried, car-miles and seat-miles operated and the week day trains in service.

Improvement in Service

Of particular interest is the improvement in running times due to electric operation. The latest electric time-table shows decrease in running times over the old steam

* Paper presented at the Regional Meeting of the American Institute of Electrical Engineers, Chicago, Ill., November 28-30, 1927.

service of from 11 to 28 per cent for the various classes of trains, the larger percentages resulting for trains to Kensington and beyond. The decrease in over-all time results from high maximum speeds and by the use of high accelerating and braking rates. Acceleration is at the rate of 1½ mi. per hr. per sec., which is about six times as rapid as that of through passenger steam trains. Under normal operation, a train will reach a speed of 28 mi. an hr. in 20 sec. After that point, the rate of acceleration falls off but on level tangent track a train will reach a speed of 50 mi. per hr. in two minutes. With present average voltage conditions, balancing speed is about 64 mi. per hr. Although comparatively high braking rates have been accomplished on steam trains, these also have been increased so that electric trains brake at the rate of 1¾ mi. per hr. per sec.

There has been a large gain in electric operation as compared with steam operation from the standpoint of operating a congested terminal. This improvement will become of greater importance as the service grows, inasmuch as under steam operation the limit to the number of trains physically possible to move in or out of the Randolph Street Terminal was rapidly being approached. It is readily apparent that this gain is made by the elimination of movements necessary for steam locomotives in changing ends of trains, and also in being brought from and taken to the engine terminal, since these movements must be made over the tracks serving useful train movements. The electric train requires only the normal loaded movements over these busy sections, except when brought from or taken to storage tracks at the beginning or end of rush hours.

The speed and reliability of electric service has been further enhanced by other improvements of the entire terminal. These include changes in the grades, rearrangement of tracks, elimination of railroad grade crossings, installation of high platforms at all suburban stations, installment of additional interlocking plants and rebuilding of the entire automatic block system to conform to electric traction requirements, a great part of which had been completed at the time of beginning electric operation.

Equipment

The results obtained from the motor-trailer combination have been satisfactory to the operating officers. The elimination of all steps on the cars for regular operation which requires high platforms, the use of sliding doors, fully enclosed vestibules, tight lock couplers, automatic acceleration and electro-pneumatic braking have all tended to increased convenience of the passengers and to safety and speed of operation. The employment of a large amount of aluminum or aluminum alloys in side and roof sheets, doors, conduit and fittings has materially reduced the weight of the cars and thereby, the operating expense.

For the year ending September 1, 1927, the average cost for maintaining the cars has been about six cents per car-mile. The weight of the motor car is 70.65 tons and the trailer 44.27 tons,—an average weight per car of 57.46 tons. Delays due to electrical equipment have been very few and no radical changes in design have been found necessary. Minor changes incident to new designs have been made, but at very slight expense. Fig. 2 shows the kw.-hr. per car-mile with corresponding average temperatures. Electric heating of cars is, of course, largely responsible for the variation between the different months, but changes in time-table also affect it slightly.

For the year ending September 1, 1927, the total energy supplied under the contract with the Commonwealth Edison Company was 57,274,512 kw.-hr. Of this, 92.7 per cent was for traction purposes, including heating of cars, 6.1 per cent for light and power, and 1.2 per cent for signals. Fig. 2 also shows the maximum demands by months and the variation with the temperature.

Power Supply

The contract provided that the railroad company guarantee a 30 per cent load factor. From Fig. 2 it will be noted that the variation in load factor is well above the guarantee. Fig. 3 shows typical summer and winter week day load curves.

The supply of energy by the power company in specified feeders to the right-of-way line of the railroad

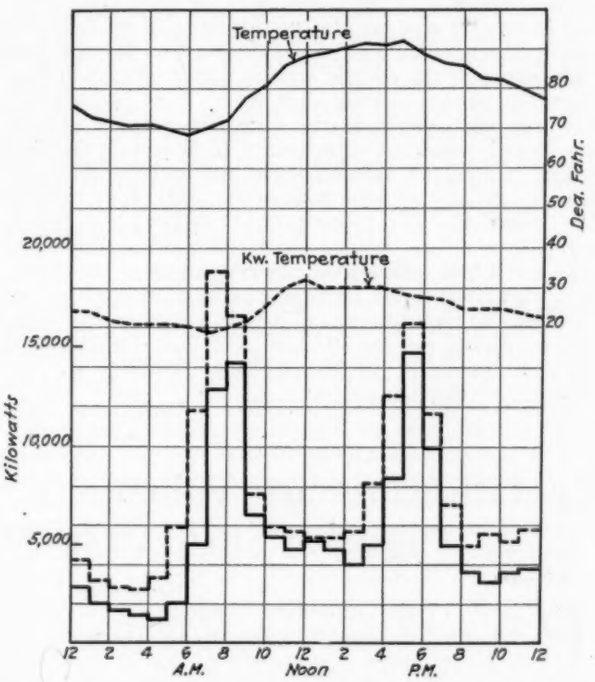


Fig. 3.—Typical Summer and Winter Week-Day Load Curves and Temperatures

company from the seven substations has been looked upon from some quarters with misgivings. This requires that not only the conversion machinery but all protective apparatus in the railroad company's feeders be maintained by the power company. The railroad company, however, has taken over, under normal operation, the control of all traction feeders by use of its supervisory control system. So far the results obtained have been satisfactory with the power company's broad-minded policy in operating under the necessarily somewhat complicated agreement.

Discrimination of the high-speed circuit breakers has been excellent. The overhead network on a multiple track railroad such as this installation covers is complex due to a necessity, in case of a fault, of having a minimum amount of track out of service. Isolation of individual sections in case of trouble has come up to expectations with very good protection to line and equipment. Furthermore, the power supervisor controlling the traction feeders has immediate information as to opening of breakers. He is located in the office of the train dispatcher, so that by working close together, trouble from a train going from a live to a grounded

dead section has been minimized. The use of wayside signals indicating a dead trolley section at points where the sectioning is outside the limits of interlocking plants has also saved burn-outs of overhead.

The cold weather of the first winter indicated that a few minor changes, especially in pull-offs, were desirable. The delays which have occurred, however, have been small considering the size of the installation and the number of trains operated.

General Results

As indicated by Fig. 1, it is apparent that the traveling public will use a clean, fast and reliable transportation system. The off-peak business has increased materially, which, of course, is the most satisfactory business to have.

As announced in the newspapers recently, the operating income is now on the right side with an indicated profit for the year 1927 as against a loss for the year 1926 although the electric service was in operation four complete months during that year. It is pointed out, however, that this does not take into account any investment in road and equipment. In providing the electrified service the railroad spent ten and one-half millions of dollars for new equipment, about four millions for electrical work, including overhead, switching equipment, return system and miscellaneous, and about nine and a half millions for rearrangement of old tracks, new track and station facilities and separation of grades, or a total of twenty-four millions in improvements only. An additional twenty millions of dollars was spent in the rearrangement of the terminal facilities for the whole electrification project.

Tentative Primary Valuations Placed at $16,612,000,000

WASHINGTON, D. C.

PLANS of the Interstate Commerce Commission for bringing down to date as of December 31, 1927, its primary valuations of railroad property, which in tentative form have now been completed as of various valuation dates ranging from 1914 to 1921, were outlined by Charles F. Staples, director of the Bureau of Valuation, before the convention of the American Short Line Railroad Association at Washington on December 8.

At the same time Mr. Staples disclosed the total of the tentative valuations as of their respective dates, which now average some ten years ago, as $16,612,000,000 for the carrier property used by Class I, II and III railroads. Using data from the partially completed reports the commission in the 1920 rate case used a tentative aggregate valuation of $18,900,000,000 as of 1919, and, speaking generally, members of the commission have referred to the valuation at present on the same basis as approximating 22 billions. The commission is now turning its attention to revising and correcting the primary valuations with reference to changes in the properties since valuation date.

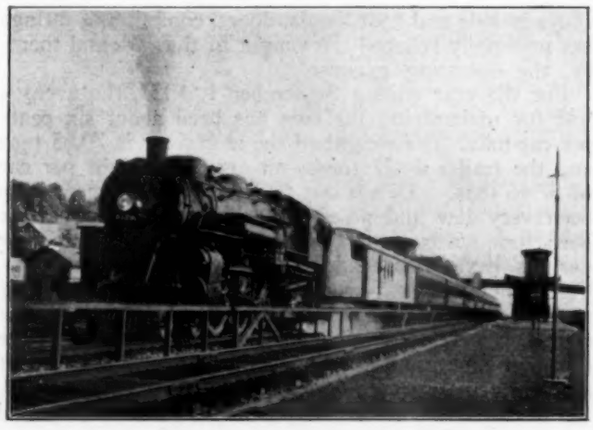
The last of the tentative valuations was issued some weeks ago and while reports had been made final as to only 21.61 per cent of the mileage on October 31, the commission hopes to have the hearings completed in the great majority of cases by June 30 and in its annual report said that "conditions are favorable for early disposal of cases which may not be decided by that date." Hearings had been completed as to 68 per cent of the mileage. This far the final valuations have not differed greatly in amount from the tentative figures.

The commission intends soon to issue an order, Mr. Staples said, requiring all carriers to prepare lists by units of property showing those added to or deleted from the property since valuation date. Under Order No. 3 carriers have been required to keep their records in such shape that the commission may determine the changes, in accordance with paragraph (f) of the valuation act. This provides that upon the completion of the primary valuation the commission "shall thereafter and in like manner keep itself informed of all extensions and improvements or other changes in the conditions and value of the property, and shall ascertain the value thereof and shall from time to time revise and correct its valuations . . ."

In three annual reports the commission has recommended to Congress an amendment of the law to clarify the meaning of this paragraph, particularly the words "in like manner."

Mr. Staples plans, he said, to have the railroads bring in their reports, together with recommendations and supporting data, for conference with representatives of the Bureau of Valuation in an effort to establish values which may be satisfactory to both sides in as many cases as possible, to be submitted to the commission for final decision and he said he desired to have the co-operation of the carriers so that points of difference may be considered while the work is in progress to as great an extent as possible, instead of being reserved for later attacks. While it is expected to put representatives of the bureau into the field it is not the purpose to re-inventory the property. Committees have been organized in the bureau, representing the land, engineering and accounting sections, and the Class I railroads have been invited to designate co-operating committees with three members for each of these branches of the work. Mr. Staples also invited the short line association to appoint a similar committee with two representatives for each section. It is expected that it may take two years or more to complete the task of bringing the primary valuations down to date.

In addressing the short lines Mr. Staples said that of the 1,716 companies covered in the valuation reports, 195 are Class I carriers and 1,521 roads of Classes II and III. The total of the tentative valuations of the property owned by the Class II and III carriers is $4,390,000, while that of the property used is $1,385,000. Much of the property owned by these carriers is used by Class I carriers.



On the New York Central Near Beacon, N. Y.

The Question of Railroad Valuation*

Exaggeration of effects that would be produced by giving weight to reproduction cost — Commission's method unfair and economically unsound

By Samuel O. Dunn
Editor of the *Railway Age*

FOURTEEN years ago Congress passed a law, of which the late Senator Robert M. LaFollette was the author, directing the Interstate Commerce Commission to make a valuation of all the property of the railways of the United States. Although the work is not finished, it has now cost the government more than $30,000,000 and the railroads about $100,000,000. The decision rendered by the commission last spring in the case of the St. Louis & O'Fallon railway settled definitely that between a majority of its members and the managers and counsel of the railways there are differences of a fundamental character regarding the nature of railroad property, the constitutional rights of investors in railroad securities, and the economic principles which must be applied in the regulation of privately-owned railroads if they are to be able to furnish satisfactory service and private ownership is to be maintained.

In its decision in the O'Fallon case last week the United States District court threw no light on the subject of valuation, because its decision turned on questions especially involved in the case of the O'Fallon and did not pass upon the broad questions of valuation raised by the majority opinion of the Interstate Commerce Commission in this case.

I say fundamental differences have been disclosed between only a majority of the members of the commission and those who represent the railways because the opinions rendered by the commission in the O'Fallon case show there are also fundamental differences between its own members. The majority decision was concurred in by only six members, while four of them, in an opinion written by Commissioner Hall, dissented with the utmost emphasis, contending that the decision reached by the majority was contrary to the decisions of the Supreme court for more than 30 years. "It will be seen," said the minority opinion, "that the divergence between the majority and the minority as to our authority under the law is basic." When, therefore, I refer in this discussion to the position taken by the commission I have in mind the position taken by only a bare majority of its members.

The questions involved are of great importance. Their importance is, however, exaggerated in propaganda that is being disseminated. The statement has been widely published that if the railways should win, and a valuation greater than that on which rates are now based should be made, a corresponding general advance in railway rates would be authorized—that, for illustration, if the valuation should be increased 50 per cent this would authorize a 50 per cent advance in rates. Such statements are wholly misleading. The valuation, whatever it may be, will affect only the net operating income the railways may earn. This even in the comparatively prosperous year 1926, was less than 20 per cent of their total earnings. It follows that a valuation that would authorize a net return 50 per cent greater than that earned in 1926 would, even theoretically, authorize a general advance in rates of only 10 per cent, while one that would authorize a net return 25 per cent greater would, theoretically, authorize an advance in rates of only 5 per cent. I use these figures only for purposes of illustration, because, while it is inconceivable to me that the Supreme court will uphold the commission's theory of valuation, it is also inconceivable to me that it will render a decision authorizing a valuation as much as 50 per cent greater than that on which rates are now based.

Some Valuation History

If one is to understand why the present struggle over railroad valuation is occurring, and the issues involved, he must know something of the history of valuation. The railroads did not start the struggle. They had it forced upon them. They did not originally advocate the main principle for the recognition of which they are now contending. It was originally advocated by persons who were trying to secure low valuations as a basis for the reduction of rates. One of the first advocates of the cost of reproduction principle was William Jennings Bryan, who was an advocate of government ownership. The author of the valuation law, the late Robert M. LaFollette, was long the bitterest critic of the railways in public life, and also became an advocate of government ownership.

The first important case in which the Supreme court passed upon the question of railroad valuation was the Nebraska rate case (Smythe vs. Ames), which it decided in 1898. The most important issue in that case was the same as in the O'Fallon case. This was as to whether valuation should be based upon the number of dollars that had been invested in the railways, or should be an ascertainment of their "present value" arrived at by considering all factors entering into it, including what it would probably cost to reproduce them. When the Nebraska rate case came to trial wages and prices had been declining for some years and were low. It would have cost less to reproduce the railways then than the number of dollars that had been invested. Mr. Bryan, who was an attorney for the state, contended that the "present value of the roads, as measured by the cost of reproduction, is the basis upon which the profits should be computed". The attorneys for the railways, influenced by the same conditions as Mr. Bryan, contended that the valuation should be based upon the actual investment.

The Supreme court held that investment was not the only thing to be considered. In the series of decisions beginning then, and extending over a period of 30 years, it always has held that the basis on which railways and public utilities are entitled to earn a fair return is their "present value"; that in ascertaining "present

*An address delivered before the Traffic Club of Chicago on December 14, 1927.

value" all factors influencing it must be considered; and that among these cost of reproduction must be included and given weight. Another of the factors it has held must be considered is that of such actual depreciation in the property as occurred, but never has it held that depreciation should be deducted from the actual investment regardless of any increase that may have occurred in what it would cost to reproduce the properties.

In cases arising in the years immediately following the establishment of this doctrine it authorized valuations less than the actual investment. In public utility cases arising in more recent years it has meant that valuations must exceed actual investment. But the principle that "present value" is the basis of rate regulation under the constitution of the United States always has been maintained.

There can be no doubt as to what has been the principal reason. It has been that, while the railways are subject to regulation because of the character of the service they perform, they are otherwise as strictly private property as any other property. Therefore, their owners are no more entitled to protection from loss due to decline in the value of their property than owners of other property; and likewise they are entitled to benefit by increases in its value like owners of other property.

The Commission's Method of Valuation

Now, how does the commission propose to make a valuation of the railways? It contends that the fairest basis would be what it calls "prudent investment". It says, however, that the investment in most railways is unascertainable. Therefore, excepting land, it divides their physical property into two parts—that constructed up to 1914, and that constructed since. It says it has found that the "unit costs"—wages and prices—that prevailed in 1914 were approximately averages of those that prevailed for some ten or twenty years previously, and that, therefore, an estimate of what it would have cost to reproduce them in 1914, based upon these costs, amounts to approximately the investment that had then been made. Having thus estimated both cost of reproduction and actual investment as of 1914, it adds the investment that has been made since. From the total thus arrived at it makes a deduction, averaging perhaps 18 per cent for the railways as a whole, for alleged depreciation due to so-called "loss of service life" of the various parts of the railroad plant. This is where the important question of depreciation comes in. It then adds land at its present value and something for working capital, and, omitting certain details, the result is the final valuation.

It seems plain at a glance that, according to the commission's own reasoning, a valuation made in accordance with the method it favors, would be, as to all railway property excepting land, less than the actual investment. This is because of the large deduction for alleged depreciation made from the estimated investment. As near as I can estimate this would amount for all the railways to around four billion dollars. If they are to be restricted to a net return on that much less than the actual investment in their properties, excepting land, it is surely a serious matter. When, how and why did this enormous depreciation occur? It is the duty of the directors and officers of a railway to keep the investment in it intact, if they can. It is the duty of a government body that regulates the rates charged and the return earned to let the railways include in their operating expenses sufficient charges to offset depreciation and earn a fair return over and above this. The average return upon their property investment reported during the more than 20 years their rates have been under effective regulation by the Interstate Commerce Commission has been considerably less than five per cent. If throughout this time there has been occurring, without any notice of it being taken in their accounts, a large amount of depreciation in their properties, it follows that the total operating expenses incurred by them have been much larger than those reported, and that, in consequence, the net return earned has been much smaller than has been reported and far below a fair return. It has often been charged that regulation has been confiscatory. If there actually has been accruing this gigantic amount of depreciation, which the commission now proposes to write off at one stroke, then the commission has carried on the confiscation of railways on a much grander scale than ever has been charged or even suspected. Since the commission proposes to now make this deduction for depreciation in arriving at the basis on which the railways may earn a return in future, it follows that it now proposes to consummate the process of confiscation and make it permanent. Would this be just to the owners of the railways or in accordance with sound public policy?

The Question of Reproduction Cost

A still more important question is that of the question of the weight that should be given in valuation to what it would cost to reproduce the railways at the present wages of labor and prices of materials. There is no issue involved so generally misunderstood or widely misrepresented. It is a curious feature of the situation that the commission says it has estimated the investment that had been made in the railways up to 1914 by ascertaining approximately what it would have cost to reproduce them at the wages and prices of that year, but maintains at the same time that any estimate of what it would cost to reproduce them at the wages and prices prevailing now would be irrational, illusory, fantastic, misleading, and so on. Then it proceeds in its opinion to give figures purporting to be estimates of what the cost of reproduction would have been at the wages and prices prevailing in different years since the war, thus affording irresponsible and reckless writers for the radical press figures that they are using to show that on the basis contended for by the railways the valuation would amount to 33 billion dollars or more.

As the commission puts in the property constructed since the war at its actual cost, less depreciation, the question of the weight that should be given to reproduction cost pertains mainly to the part of the properties that existed in 1914. The reported investment in 1914 was about 17 billion dollars, and as to the parts of the properties then existing the commission refuses to give any weight whatever to what the present cost of reproduction would be, although at present day costs it would be about 70 per cent more than in 1914.

Now, of course, the railways—like the four minority members of the Interstate Commerce Commission itself—attack this position upon legal grounds. They contend it is unconstitutional because it gives no recognition to the fact that, the so-called "prudent investment" is not the thing to be ascertained, but the "present value" of the properties, and that this cannot be legally determined without giving weight to present cost of reproduction.

The claim widely made that a valuation made otherwise than the commission proposes would be some 11 billion dollars greater than one made by its method is based upon the assumption that there is not and cannot be any middle ground between a valuation based virtually on so-called "prudent investment" and one based solely on cost of reproduction, and that, conse-

quently, if the commission's method of valuation is rejected by the courts the only alternative will be a valuation based solely on cost of reproduction. This is a smoke screen thrown up to protect the extremely radical position taken by the commission. There is no reason whatever for assuming or contending that the valuation must either be made as the commission proposes or based entirely on cost of reproduction. There would be no reason for assuming this even if the railways were contending for a valuation based solely on cost of reproduction. The Supreme court of the United States is not obliged in deciding between two parties to a litigation to hold that one or the other of them is entirely right and that therefore the other is entirely wrong. In this, as in all other litigation, it is perfectly free to hold, if this is its conclusion, that both parties are partly right and both partly wrong.

Position of the Railways

But what is the position actually being taken by the railways in the valuation litigation? What their counsel are contending, as is plainly shown by the language of their brief filed in court in the O'Fallon case, is that the commission's method of valuation is legally and economically unsound because it does not give "effective weight" to the factor of cost of reproduction. It is true they intimate this factor should be given "dominant weight," but it is hardly necessary to say that the exigencies of legal strategy very commonly render it necessary for lawyers to take what seems to the layman an extreme position. There is no decision of the Supreme court which would sustain the view that the valuation of each and every railroad or public utility is merely a matter of finding out what it would now cost to reproduce it. What the court has always held is that the "present value" must be ascertained, that in order to determine this all factors entering into it must be considered, and that therefore it cannot be determined without giving due weight to present day costs. Is that not a reasonable view from an economic standpoint? Did anybody ever decide upon the value of any kind of property brought into existence by the use of labor and materials without considering what it would cost to construct it at the time he was proposing to buy it?

That weight be given to cost of reproduction is in accord not only with decisions of the Supreme court but also with express provisions of the LaFollette valuation law. That law requires the commission to "ascertain and report in detail as to each piece of property, other than land, * * * the original cost to date, the cost of reproduction new, the cost of reproduction less depreciation, and an analysis of the methods by which these several costs were obtained and the reason for their differences, if any. The commission shall, in like manner," it adds, "ascertain and report separately other values and elements of value, if any, of the property of such common carrier and an analysis of the methods of valuation employed and of the reasons for any differences between any such value and each of the foregoing cost values."

It is an interesting fact that the commission includes land in the valuation at its present value—that is, at the present value of other land lying adjacent to that of the railways. Evidently this is because the Supreme court quite definitely held in the Minnesota Rate Case that this must be done. But if land must be included at its present value, upon what logical principle can the rest of the property be given a so-called "valuation" which is based on its estimated cost, less depreciation? The commission's course in including land at its present value is obviously inconsistent with its entire line of reasoning and also with its conclusions as the way the value of all other railway property should be determined.

As a practical matter, how much would the valuation amount to if "effective weight" were given to present cost of reproduction? Nobody can answer that question. The answer depends on what is "effective weight"? Depending upon the circumstances of the particular case, it might be held that giving effective weight to cost of reproduction would make the valuation 50 per cent greater than the so-called "prudent investment" or 25 per cent greater or even a smaller percentage greater.

I have no doubt that if the commission in its decision had given any substantial weight to cost of reproduction it would have gone a long way toward a settlement of the entire question of valuation. There is a wide difference between the result that would be arrived at by using its method, and the result that would be arrived at by taking into consideration the actual investment, the probable cost of reproduction less depreciation, the going value, and so on, mainly because the commission deliberately adopted the lowest basis of valuation, excepting as to land, that ever has been advocated by anybody. It threw away the opportunity it had to suggest some reasonable compromise, took a position it knew the railways could not accept, and thereby made certain litigation that would prevent a settlement of the matter for many years.

How Shall Railway Property Be Treated?

What is the real crux of this whole problem of valuation? The great issue it presents is as to whether, first, the property of the railways is to be treated substantially like other property that is privately owned, as the courts heretofore have held it must be; is to decline in value when the value of other property declines and increase when the value of other property increases; is to be protected by the courts from confiscation as other property is protected; or, secondly, is to be treated entirely differently from other property and from the way in which the courts have held in the past that railway property must be treated. If the former policy is to prevail the courts will set a limit below which the valuation of railway property and the net return on it may not be reduced. If the commission's view of valuation prevails the railways will have withdrawn from them the protection from confiscation under the constitutional law of the land which they have heretofore been accorded by the courts.

How do the majority of the commission and those who defend the position it has taken believe the railways should be regulated? The attorneys for the commission, in their brief in the O'Fallon case, say: "Must we not get back to the fundamental principles * * * that railroads are private property only in the sense that the title is held in private ownership, but that the investment, whether in money or in property, is 'dedicated' to the performance of a 'governmental function' and is to be treated as nearly as may be as if the government itself had made the investment and had issued and sold to private parties the securities representing that investment". Does not that mean that, since the government can borrow money at a low rate of interest, it should, in its regulation of the railways, not only refuse to recognize any increase in excess of the investment that may occur in the value of their properties, but also restrict them to an annual return equivalent to a low rate of interest? The attorneys for the commission in the next sentence in their brief add: "The exercise of a governmental function by a private agency can only be justified and continued if we enforce with practical wisdom the closest practicable analogy to government ownership and operation".

The principal argument advanced at length by the

commission in its opinion in the O'Fallon case against a valuation giving effective weight to present cost of reproduction is that this would make the valuation too large because it would entitle the railways to earn too much net return. Who is to decide what is too much? The commission's lawyers in the O'Fallon case take the position that the determination of what is "fair value," "rests in the judgment of the commission as to what is 'fair' to the public as well as to the railroads." The commission is declared to be "an expert commission 'appointed by law and informed by experience' whose findings will be respected and sustained by the court unless it clearly appears to amount to 'confiscation'." But the meaning always attributed to the word "confiscation" in the past is to be changed. There can be no confiscation, the commission expressly contends in its opinion, if it can be shown that the railways have been able to raise enough capital to render adequate service. On this theory, if the railways go into court to show the commission has committed confiscation they must show not only that they have been unable to raise adequate capital, but that this has been due to the fact that the commission has unduly restricted their valuation and the return they have been allowed to earn upon it. In other words, there will be no control or restriction by the courts upon regulation by the commission until a shortage of transportation has developed, and then, in order to satisfy the court there has been "confiscation", it will be necessary to prove that the shortage of transportation has been caused by the commission's regulation.

Of course, this means that if the commission's views should be upheld, the determination of what valuation should be placed upon railway property and what return should be allowed to be earned upon it would be left almost entirely to the commission.

Probable Effect on Railway Development

What would probably be the effect upon railway earnings, development and service? The commission always has been, is now and always will be subject to powerful pressure, largely political in character, for reductions of rates and restriction of railway net return. This kind of pressure resulted before the war in regulation of rates which caused a decline in net return, arrested railway development, resulted in prolonged shortages of transportation and at last precipitated government operation. It has been stated that the total valuation of the railways, if made according to the method the commission favors, would be at present about 23 billion dollars. Those outside the commission who have made calculations on the basis of valuations of numerous railways made according to its method have been forced to conclude that the aggregate valuation would be much less than this, and would be several billion dollars less than the total investment in property now indicated by the carrier's accounts. Furthermore, the commission, throughout the more than seven years the Transportation Act has been in effect, has shown a strong indisposition to so regulate rates as to enable the carriers to earn even on its own "tentative valuation" the return of 5¾ per cent annually which it has held would be fair. Approximately this return has been earned by the railways as a whole only in 1926, and the western lines never have approached it. The commission's past policy in this regard has been defended on the ground that the large investment made in railways within recent years, the adequate service they have rendered and the present market prices of their securities, show that they have been allowed to earn enough, which, by plain implication, means that corresponding or even relatively smaller earnings would be sufficient in future.

There are several answers to this argument. First, the railways recently have been able to earn and invest so much capital because from 1921 to 1926 their net operating income was increasing and it was assumed that they would finally be allowed to earn as an annual average at least what the commission had held would be a "fair return." In 1927, however, their net operating income substantially declined. Secondly, the investment of capital since 1920 has not been relatively as large, measured by the purchasing power of the dollar, as that made in most years before the war, and has thus far proved sufficient partly because railway traffic has increased relatively much less since 1920 than it did before. Third, the railways have succeeded in greatly increasing the efficiency of utilization of their facilities partly because of co-operation between themselves through the Car Service Division, and partly because of a new form of co-operation between them and the shippers through the Regional Shippers' Advisory Boards. A good deal of "slack" in the utilization of facilities has thus been taken up; but that resource will not be available in future. Therefore, it would seem that if there shall be a normal growth of traffic in future there will be need for a larger annual investment in railway facilities than has been made since 1920.

Would regulation in accordance with the policy favored by the commission in its opinions in the O'Fallon case be sufficient to induce adequate investment? Every one is entitled to his own opinion about that. As the proposed policy probably would restrict the railways to a relatively smaller return than that which, before the war, caused a serious and disastrous decline in railway development, I am unable to believe that it would in future promote adequate development. On the other hand, a decision of the Supreme court requiring the commission to make a valuation large enough to give reasonable weight to present day costs would tend to give opportunity to earn adequate net returns.

Would the railways, if given a substantially larger valuation, immediately seek to make the huge advances in rates with which propagandists for the commission's method of valuation seek to alarm shippers and the public? I do not believe that a valuation that gave due weight to cost of reproduction would be large enough to justify large advances in rates, although it undoubtedly would seriously interfere with reductions for some time to come. Furthermore, it is highly improbable it would ever be possible to get the railways to agree to seek an advance in rates sufficient to give a so-called "fair return" on a valuation largely in excess of their property investment. The managements know that if they did so they would encounter the united opposition of shippers and would arouse a very hostile public sentiment. Railway officers fully realize that, while earnings should be sufficient to make possible adequate development of transportation, rates must be based on what the traffic will bear and also on what public sentiment will fear.

Much Involved in the Controversy

In this struggle over railroad valuation there may be much more involved than a difference of opinion regarding the valuation that should be placed upon the railroads, the amount of net return they should be allowed to earn and the rates they should be allowed to charge. The Interstate Commerce Commission, in favoring the method of valuation it does, has, in effect, demanded that the Supreme court of the United States reverse the series of decisions rendered by it over a period of thirty years, setting forth the constitutional rights of the owners of railroad and public utility properties. If, in the supposed interest of the public, the constitution as it has heretofore been held to apply to railway property, can

and should be thus changed, why can and should it not be similarly changed as to other forms of property? Senator Smith W. Brookhart of Iowa actually has proposed, in effect, that this shall be done. He said in a recent address: "Credit laws should be amended to enable the farmers to derive the fullest benefit; railroad securities should be condemned and consolidated at the market value; the rate system of return for all public utilities should be reduced to the average of all capital; and the rate of return of corporations in interstate commerce should be regulated in the same way." Practically all large corporations are engaged in interstate commerce. Why not appraise their property as the commission proposes to appraise that of the railways, and then restrict them to the so-called "fair return" on their valuation? You may say it would be unconstitutional to thus regulate other large corporations. But all past interpretations of the constitution by the courts must be changed before the railways can be thus regulated. You may say it would be contrary to the genius of American institutions, unreasonable, unfair, socialistic, and in the long run destructive of the public welfare. If that is true, then upon what logical ground can it be contended that such a change in the constitutional method of regulating the railways would be reasonable, fair and conductive to the public welfare?

When, in the supposed interest of public expediency, we begin to make changes in the constitutional law of the country applicable to railway and public utility property, may we not find we have merely begun to make far-reaching changes in the constitutional law protecting all property? A member of the Interstate Commerce Commission recently has advocated ownership of railways and public utilities by the government upon the ground that it is a function of government, and has said, "There are certain functions which clearly belong to the state and these it ought, in self respect, to perform itself. They ought not, in my opinion, to be degraded by conversion to the ends of private profit." There are many persons who believe that the operation of any kind of business for private profit is degrading, especially when the resulting profits are large.

If the constitutional law of the land applicable to railway property is so flexible—if it could be used in 1913 to keep down railways profits and can be changed in 1927 to effect the same purpose—then why is it not equally flexible as to all other kinds of property, and why should it not be so changed as to carry out Senator Brookhart's plan of regulating the profits of all large corporations in the same way that the Interstate Commerce Commission favors regulating the profits of railways?

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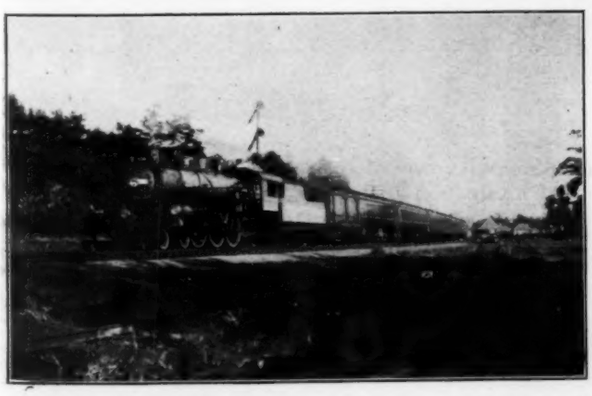


The B. & M.'s "Paul Revere," a Locomotive in Blue and Buff on the "Minute Man"

Freight Car Loading

WASHINGTON, D. C.

REVENUE freight car loading during the week ended December 3 amounted to 915,408 cars, a decrease of 135,811 cars as compared with loadings in the corresponding week of last year and of 105,431 as compared with 1925. Grain and grain products was the only commodity classification which showed an increase over loadings a year ago. Coal loadings amounted to 158,196 cars, a decrease of 92,602 cars from the corresponding week of last year, and ore loadings 9,506 cars, a decrease of 1,419 cars. Loadings by districts were smaller in every instance than in the corresponding week a year ago. The summary, as compiled by the Car Service Division of the American Railway Association is shown as follows in the table directly below:

Revenue Freight Car Loadings

WEEK ENDED SATURDAY, DECEMBER 3, 1927

DISTRICTS	1927	1926	1925
Eastern	200,398	238,199	227,913
Allegheny	179,581	218,741	199,661
Pocahontas	46,523	65,181	60,064
Southern	147,386	165,940	163,835
Northwestern	114,933	115,246	121,470
Central Western	143,367	155,966	157,054
Southwestern	83,220	91,946	90,842
Total Western districts	341,520	363,158	369,366
Total all roads	915,408	1,051,219	1,020,839
COMMODITIES			
Grain and grain products	49,808	48,376	59,633
Live stock	34,425	34,843	36,708
Coal	158,196	250,798	191,833
Coke	9,031	12,962	15,936
Forest products	61,015	64,604	69,939
Ore	9,506	10,925	12,857
Mdse. L. C. L.	256,837	261,712	262,793
Miscellaneous	336,590	366,999	371,140
December 3, 1927	915,408	1,051,219	1,020,839
November 26	840,803	937,844	923,206
November 19	968,103	1,071,707	1,057,923
November 12	974,862	1,106,889	1,049,940
November 5	1,038,852	1,131,832	1,062,646
Cumulative total, 48 weeks	49,197,553	50,401,207	48,544,657

The freight car surplus for the period ended November 30 averaged 352,168 cars, as compared with 301,393 cars November 23. The total included 158,304 box cars, 148,860 coal cars, 20,551 stock cars and 11,540 refrigerator cars.

Car Loading in Canada

Revenue car loadings at stations in Canada for the week ended December 3 totalled 78,123 cars, a decrease of 2,530 cars from the previous week and an increase of 8,411 cars over the week ending December 4 one year ago.

	Total for Canada			Cumulative Totals to Date	
	Dec. 3	Nov. 26	Dec. 4		
Commodities	1927	1927	1926	1927	1926
Grain and Grain Products	21,527	23,652	14,312	474,119	468,622
Live Stock	3,296	3,769	3,085	115,342	109,750
Coal	10,347	9,592	9,695	341,151	300,809
Coke	401	456	422	17,500	18,293
Lumber	2,941	3,184	3,020	178,953	174,690
Pulpwood	1,547	1,355	1,148	136,738	120,349
Pulp and Paper	2,289	2,356	2,210	106,644	113,747
Other Forest Products	3,540	3,498	3,085	146,749	147,728
Ore	1,587	1,551	1,645	82,331	84,494
Merchandise, l. c. l.	17,554	17,748	17,309	828,100	792,409
Miscellaneous	13,094	13,492	13,781	722,675	694,640
Total Cars Loaded	78,123	80,653	69,712	3,150,302	3,025,531
Total Cars Received from Connections	32,313	33,769	36,844	3,104,492	1,796,778

The Neglected Science of Railway Storekeeping

Underpaid stores officers among the causes of surplus materials

By R. A. Weston
Certified Public Accountant, New Haven, Conn.*

Part IV

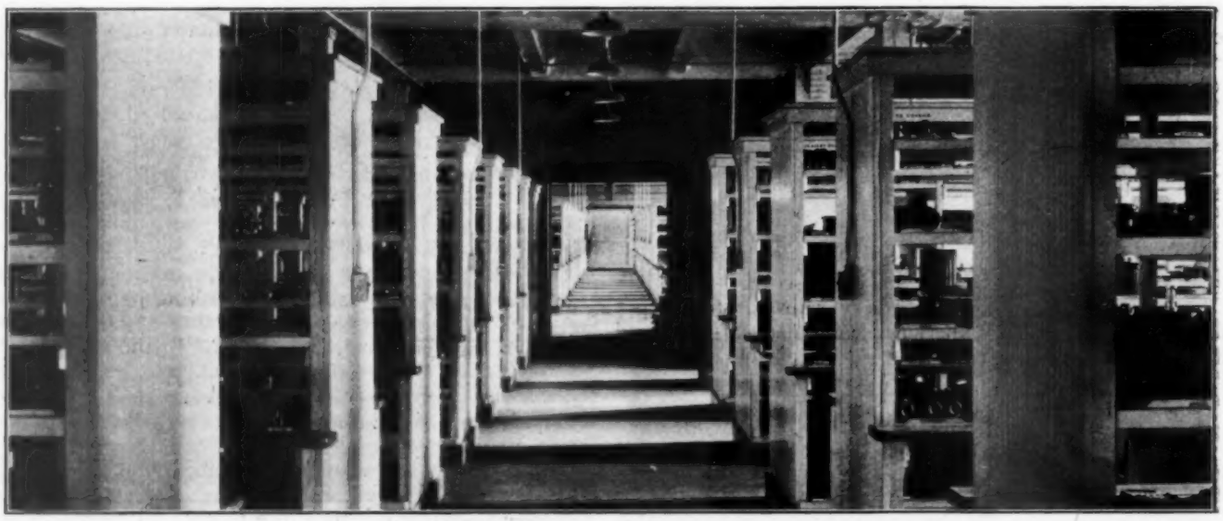
SURPLUS stocks result from the purchase of materials in excess of the amounts actually needed for use. In so important a work as the control of stock involving hundreds of thousands of dollars, the problem should be entrusted only to one of first class ability, and furthermore, this and other problems having to do with the care and distribution of material should constitute his sole duty. In other words, the store's work should not be made a side issue of some other job. The master mechanic, the signal engineer, the superintendent of shops, or the engineer of maintenance of way should not have included as a part of his job the upkeep of the stocks of material required for the use of his department. This is quite generally recognized on railroads today and the store departments have been organized, with a general storekeeper in charge. While this is quite well recognized, it has not been so well appreciated that the task is of the first magnitude, and that a man should be put in charge who will compare favorably as to ability and paid a salary corresponding to those of the heads of the various operating and mechanical departments with whom he will come in contact. This can be said to be one of the main contributing causes for accumulations of excessive stocks. The man in charge of the department has not organized it in a proper manner and succeeded in bringing about a sufficiently scientific method of ordering material.

*This concludes a series, earlier articles appearing in the *Railway Age* of September 24, October 15 and November 19.

Another cause of excessive stock is in the way improvement and betterment work is undertaken, the bills of material prepared for it and the requisitions placed on the purchasing department. Generally the course of procedure is somewhat as follows: An improvement that will result in a reduction of operating expenses will be discussed by the general manager with his subordinates, and the division superintendent or the division engineer is called upon to originate a form of authority for expenditure, describing the work and the saving that will result, and also preparing an estimate of the cost of the work. The recommendation with proper approvals is submitted to the president and later may receive his approval and also that of the board of directors.

The president orders the work performed and there is usually a desire to hurry to carry it out. The engineer prepares an approximate bill of material from preliminary plans and rushes it to the storekeeper or the purchasing agent and the material is ordered. Meantime detailed working plans are prepared.

Often the final bill of material made from detailed working plans differs considerably from the preliminary bill of material from which the material was actually ordered, and when the work is completed several thousands of dollars' worth of materials are left on hand in the storeroom. This is often inactive material and helps to swell the surplus stock. Thus another cause of surplus material is the ordering of material for new



No Surplus or Dead Stock Hiding in This Store

construction work from imperfect and incomplete information.

Make Storekeeper Party to Plans

Again plans are sometimes made to modernize equipment such as the equipping of locomotives with superheaters or electric headlights, where the equipment will involve material worth many thousands of dollars. Before the work can be completed other work more pressing takes precedence and the work first planned is postponed. All material has been ordered and received, however, and it thus remains for months as dead and inactive stock, representing an unremunerative investment. Furthermore, it is often very embarrassing to the storekeeper to provide proper storage for these stocks in addition to the current supply of other materials. Sometimes, too, in planning to do such work, the general storekeeper is not asked to sit at the conference and the program is concluded with insufficient attention having been paid to possible deliveries of the material, and it is later found that it will take two or three months to get these materials, which may seriously interfere with the progress of the work as planned, all of which results in the materials remaining on hand over considerable lengths of time.

Sometimes the careless writing of requisitions or orders, and the neglect to check them against the specifications cause mistakes in ordering the material, and it is not practicable to return it to the shippers. The writer recalls a case of constructing several miles of new line where the track bolts were ordered one-eighth or one-quarter of an inch too short, with the result that they could not be used and a second order had to be placed for bolts of the proper dimension. At the close of the work the first lot of bolts was among the materials left over from the construction and turned back to the storekeeper, who had to try and discover some place where they could be used. Every railroad storekeeper has had considerable experience with materials acquired in this manner and can attest to the large amount of time spent in trying to discover places in which such material can be put into use, and the periodical work and expense in moving and inventorying such stocks pending their final disposal.

Centralizing Avoids Surplus

It also soon becomes apparent in studying surpluses that the number of places in which stocks of materials must be carried has a great influence on the total quantity of materials which is maintained on a system. As between the road with one central repair shop where all the equipment repairs are conducted, and the same system and the same equipment but having the work done in two repair shops, the stock of material to be maintained will be greater in the case of the road running the two shops. The more that the stocks of material can be concentrated in one place or in a few places, the more flexible is the stock, and the smaller the investment. An example will illustrate the point. A division of a railroad may have five engine terminals where engines are housed and turned, and where there are turntables. Certain turntable castings, or turntable wheels are liable to break and to protect the operation, certain spare parts are kept at these turntables to meet such an emergency. If instead of this, the spare parts are kept at the storehouse at the division headquarters it will be found that one set of spare parts will likely protect all five turntables instead of the five sets, in view of the improbability of breaks occurring at two turntables simultaneously. There is a great deal of material of this character in railroad stocks, that is, material not actively moving in the process of repairing, but which must be carried in order to insure the continuity of the service and to protect against breakdowns, and a railroad which permits material of this nature to be scattered all over its system is bound to have a larger aggregate stock than one which has established a systematic method for concentration of such stocks to the fullest extent possible, and still protect the property.

Surplus Air Brake Material Gathered on a Railroad. A Sample of What Happens When Improvement Programs Are Poorly Planned

Better Distribution Helps

The method which a railroad follows in making the distribution of materials to the users also has a decided influence on the reduction of stocks. The railroad that distributes to the greatest extent possible by a supply car or a supply train rather than making its distribution by local freight trains, or by baggage or otherwise has an advantage in this respect. The method affords a personal contact at the time of distribution, gives a regularity and a dependability of service which permits lesser stocks to be carried by the users, and also permits of the quick pickup and return of any material found to be unnecessary or surplus. Thus another contributing cause of surplus material is the lack of an efficient delivery system from the store to the customers.

Notwithstanding the large stocks of materials being

carried on the books of the railroads, a large number of roads have, in addition, stocks which in the aggregate are large but which do not appear on their books. On most roads there are many so-called working stocks of material in the custody of foremen in charge of various kinds of work in all departments, which stocks have been withdrawn from the store and charged out to expenses and which are off the books. It is a common assumption that such stocks are limited to a 30 days' supply and are in process of being used and as a practicable proposition they should be considered the same as though used and charged out. It is a fiction, however, that such stocks are limited to a 30 days' supply, as they have a way of growing and accumulating to very much more than this, and it is believed that a very large percentage of railroads have no effective method of controlling and keeping such stocks within the limits of the actual necessities of the case. Until such methods have been introduced, the problem of excessive stock will not have been completely faced.

Crossing Accident in Federal Court

IN the United States Court at Toledo, Ohio, November 30, the Baltimore & Ohio entered suit against the Radiant Oil Company, of Lima, Ohio, for damages of $18,000 for destruction of railroad property by fire, when a truck of the oil company was struck by a train at Cridersville, Ohio, on August 13, last, causing the death of four persons. The truck was loaded with gasoline which took fire. In its petition, the railroad company charges that the driver of the truck, agent for the Radiant Oil Company, failed to exercise proper caution.

Following is an abstract of the report of W. P. Borland, director of the Bureau of Safety, of the Interstate Commerce Commission on this accident:

Abstract of Report

Baltimore & Ohio, Cridersville, Ohio, August 13, 10:52 a. m.—Southbound passenger train No. 51, moving at about 50 miles an hour, ran into an automobile truck on a crossing and the 800 gallons of gasoline in the tank, taking fire, set fire to the train; and four persons were burned to death; the engineman, the fireman, one express messenger and the driver of the truck. The truck driver had jumped to the ground before the collision, but was sprayed with blazing gasoline and fatally burned. The automobile was demolished and the train ran about one-half mile before it was stopped by the air brakes, which were applied by the baggage man. Four of the five cars in the train were destroyed by the fire. The inspector finds that the truck driver had a view of the train for some distance, except for a few yards close to the crossing; that he had passed over this crossing many times in making his regular trips and that had he exercised proper care, he would not have got in the way of the train. There was conflicting testimony as to the use of the locomotive whistle but the weight of evidence is held to show that a great deal of whistling was being done by the engineman as he approached this crossing.

While the traffic ordinarily moving over this particular crossing is not heavy, and perhaps does not justify elaborate protective devices, nevertheless the removal of weeds and shrubs and a slight cutting away of the top of the embankment would have made a very great improvement in the situation.

In this instance there was an unusual volume of highway traffic over this crossing on account of detours necessitated by other roads being under repair. This is a condition which frequently exists particularly in the summer months when much road work is in progress and highway travel is heavy; and it is believed that in these circumstances additional protection should be provided at grade crossings which ordinarily are little traveled but which temporarily are subject to a heavy volume of detoured traffic. This is a matter in which the railroads and the local authorities in charge of highways and highway traffic should co-operate.

Automatic Train Pipe Connectors

WASHINGTON, D. C.

THE annual report of W. P. Borland, director of the Bureau of Safety of the Interstate Commerce Commission, contains a discussion of the subject of automatic train pipe connectors, the use of which has been urged by the brotherhoods of train service employees, and which was the subject of a conference on November 30 at Washington attended by Chairman Esch and Commissioner Taylor of the Interstate Commerce Commission, representatives of the Bureau of Safety, the Canadian Board of Railway Commissioners and the firemen's, trainmen's and conductors' brotherhoods. The report says:

The Report

Automatic train pipe connectors have had limited use on both passenger and freight trains for many years past; their theoretical advantages are widely recognized, but the many efforts that have been made to bring these devices into general use have thus far resulted in failure. The safety features attending the general use of automatic connectors are obvious; it has been claimed, also, that large operating economies would accrue to the railroads through the general use of these devices. Such claims necessarily rest upon theoretical considerations, and their merit can only be demonstrated by practice.

Within recent years train service employees have devoted much attention to this question, and the general use of automatic connectors has been urged by them as a measure of safety. During the past year the matter was brought directly to the attention of the commission by train service employees, through their representatives, a request being made that the commission "take steps to bring about a conference of representatives of the Interstate Commerce Commission, the Dominion Board of Railroad Commissioners for Canada, the American Railway Association, and the Canadian Railway Association, with a view of selecting automatic train pipe couplers which with be interchangeable between cars, to be adopted as standard equipment by the railroads of the United States and Canada."

In the use of automatic connectors practically the same requirements regarding uniformity and interchangeability exist as exist with automatic car couplers. These requirements make it imperative that upon general adoption all connectors must be of the same general kind so far as the contour of their coupling heads and the type of their gathering and registering devices are concerned. With this situation in mind, the chairman of the commission conferred with the president of the American Railway Association, and suggested appropriate action by that association with a view of fostering development of connectors and determining upon standards for use which will be acceptable to the railroads generally. It was recognized that the fundamental requirements of uniformity and interchangeability could not well be settled by conference alone, but would need a complete investigation by experts of all the factors involved. The American Railway Association has appointed a joint committee, representing its operating and mechanical divisions, to gather complete data and history of the subject and report to the president of the association.

Committee Appointed

At the meeting on November 30 Chairman Esch of the Interstate Commerce Commission, Chairman H. A. McKeown of the Canadian commission, and W. N. Doak, assistant president of the Brotherhood of Railroad Trainmen, were appointed a committee to examine into the merits of the different connectors and to prepare tentative specifications of a device "which will automatically couple and connect, and automatically uncouple and disconnect, without the necessity of going between or underneath cars for that purpose." A further conference is to be held at Ottawa, Canada, or at another place to be decided upon, at some convenient date in January.

Court Decision in O'Fallon Case

THE United States District court at St. Louis on November 10 rendered a decision in the case involving the recapture of earnings of the St. Louis & O'Fallon Railway. It has been widely reported in the newspapers that the court upheld the valuation placed by the commission upon the property of the O'Fallon. This is incorrect. The court held that, in view of the nature of the case, it could be decided without passing on the important issues raised regarding the principles and methods of railroad valuation. This ruling was based upon evidence which satisfied the court that, even if the value of the O'Fallon was as great as its owners and counsel claimed, the recapture from it of the amount of earnings the commission proposed would not involve confiscation, and that therefore the issue of confiscation was not actually involved.

Regarding these matters the court said in part: "The attack upon the valuation of the property of the O'Fallon is stated to be that the commission measured such value upon the assumed prudent investment basis and failed to give 'effective and dominant consideration * * * to the cost of reprodutcion at the price levels existing at the time the issue arises.' The 'issue arises' here as to each of the several recapture periods, to-wit, the last ten months of 1920 and each of the calendar years of 1921, 1922 and 1923.

"The United States contends that there is no question of confiscation presented here and no need to examine the accuracy of the values found by the commission or its methods used in determining such values because, even if it might be conceded that the value claimed by the O'Fallon is correct, yet its net earnings thereon would, less the amount ordered paid over to the government by the order of the commission, be an ample return thereon for each of the recapture periods.

"* * * It seems that this contention of the United States is well founded; that the verity of the commission's valuation herein need not be examined and cannot affect this recapture order and, therefore, that such order is not open to attack upon the ground of wrongful valuation. If this be true, it is unnecessary to examine and determine the various contentions made by the parties and *amical curiae* concerning the proper manner of ascertaining value herein."

The percentages of return on its own estimated valuation which the road would have left after the recapture of its earnings under the orders of the commission, and which the courts held would not be confiscatory, were as follows: Last ten months of 1920, 6.97 per cent; 1921, 8.71 per cent; 1922, 8.29 per cent; 1923, 9.43 per cent.

It was contended by counsel of the railways that the earnings of the O'Fallon or any other individual railway were not subject to recapture unless on the average the roads of the group to which it was assigned by the Interstate Commerce Commission had earned a "fair return." The court said that it saw "no necessary or logical dependence" of the recapture provisions of Section 15-A upon the provisions directing the commission to so fix rates as to enable an entire group of roads to earn a fair annual return, and that Congress evidently did not intend to suspend the operation of the recapture provisions until the rate-making provisions were given full effect.

One contention made in the case was that Section 15-A was invalid "as a delegation of legislative power without prescribing a method of procedure." Regarding this the court said: "The section defined the duties of the commission as to fixing rates, declared what should be excess income subject to recapture, the disposition to be made by the commission of the recaptured funds coming into the hands of the commission and the disposition of the portion going into the 'reserve fund' left with the carrier. As to recapture it fixed a maximum percentage of return as a basis of earnings and directed the commission as to the ascertainment of property value to which that percentage should apply. In short, the section set out completely the legislative rules. The only duty left to the commission was the ascertainment of the facts in each case to which those rules were to be applied by it. It left the commission no discretion as to the application of those rules of law to the facts found by it. Therefore, no legislative power was delegated."

The law requires that one-half of the net operating income made by any carrier in any year in excess of six per cent shall be recaptured by the commission and the remaining one-half placed in a reserve fund for the carrier. The court upheld the "reserve fund" part of the provisions, saying in part: "The purpose of these provisions is obvious. It is to segregate a separate fund of a stated amount for a prescribed purpose. It is of no moment whether this be denominated a trust or not. The intention is clear and the only question is one of legislative power. * * * The Dayton-Goose Creek case has determined that Congress had power to hold the carrier to a reasonable return and to control all excess thereover. If that power extends to entirely taking from the carrier one-half of such excess, as there held, it more clearly would cover limitation of use by the carrier of the other half."

One of the issues in the case was whether the St. Louis & O'Fallon, and the Manufacturers railway, which are owned by the same interests, constitute a single system, and the court held that they do not.

The decision was rendered unanimously by Circuit Court Judges Kimbrough Stone and Arba S. Van Valkenburgh, and District Judge Charles B. Faris. Judge Faris wrote a concurring opinion in which, however, he disagreed with the conclusion of the other two judges that the court need not meet the question of legal methods of valuation. After mentioning the practical difficulties in making a valuation and keeping it up-to-date, as required by the valuation law, he said: "For the above reasons, I am not convinced that the commission erred, but am of the opinion that it reached the valuation found by it in the only way possible, in a situation so difficult that absolute certainty and correctness are well-nigh finitely impossible."

Alfred P. Thom, general counsel of the Association of Railway Executives, has given the following analysis of the O'Fallon dicision:

The majority of the court in this case (and the opinion of the majority is the decision of the court) expressly decline to consider, or to pass upon, the methods of valuation adopted by the commission in the O'Fallon case or on the correctness of the commission's valuation. The court thus does not determine whether the cost of reproduction should be ascertained by applying the current costs of materials and labor or by applying the cost of such units as they stood in the year 1914 and before.

What the court does hold is that six per cent upon the value as fixed by the commission of the O'Fallon property, plus one-half of what are termed "excess earnings" for the several years considered, taken together, constitute a fair return upon the value of the property even as claimed by the carrier.

The court thus sees no necessity for concerning itself with the commission's valuation or with the methods of the commission in reaching its conclusion.

It will be observed that the statute of Congress defines as property of the carrier six per cent upon the value (which, of course, means the true value) of its property held for and used

in the service of transportation, plus one-half of what the statute defines as "excess" earnings.

The court fails to recognize this construction of the statutory requirement as sound or as binding upon it, and does not allow what the statute, thus construed, quite plainly says the carrier is entitled to. The question will thus be presented to the Supreme Court, whether the foregoing is the true construction of the statute and, if so, whether the Interstate Commerce Commission, which is the creature of Congress, can take away from a carrier what the Congress of the United States by express statute says it shall have.

Thus it will be seen that the case went off upon a question which did not involve the correctness of the commission's methods of valuing, or the correctness of the value placed upon the railroad properties. That question is still undecided.

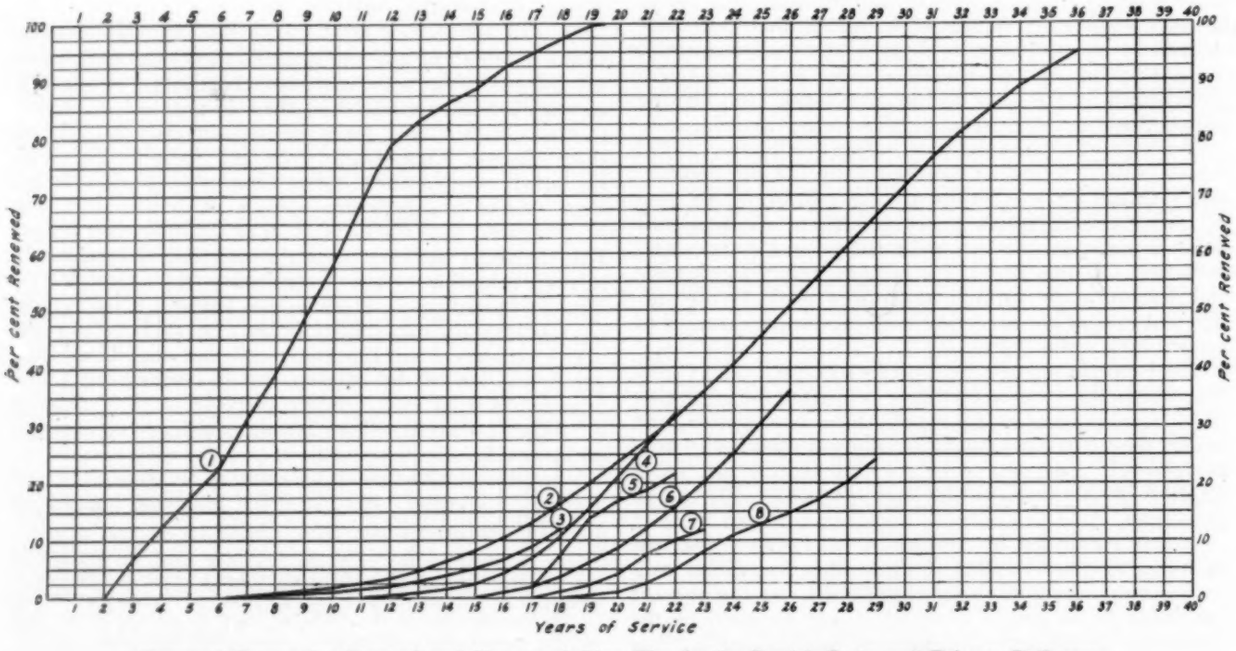
The Interstate Commerce Commission on December 9 announced a further postponement of the effective date of its order in the O'Fallon case to December 31. The previous postponement was to December 10. The date has been changed from time to time while the commission was awaiting the result of the court proceedings.

Danish Railways Get More Than 30 Years Life from Ties

THE first ties treated in Denmark were impregnated with a mixture of zinc chloride and coal tar creosote, while from 1908 on coal tar creosote has been used alone, injected by the Rueping process. During the war new salts were employed from 29, 1922, page 215. The further results that have been secured since that date are presented in a second report by Mr. Collstrop which has been translated from the Danish by M. C. Jensen of the United States Forest Products Laboratory, Madison, Wis., which is abstracted below.

Impregnation with coal tar creosote according to the Rueping method was introduced in Denmark in 1907-1908 and we have now, therefore, an experience of about 20 years' duration. In the economic retrenchment in the administration of the Danish State Railways, a comparison was made between ties impregnated with mixture and with oil during the first 18 years, from which it was seen that renewals for the latter were from 33 to 50 per cent lower. The now frequently applied adzing and boring for screw spikes *before* impregnation undoubtedly contributed to these good results. In this way the wood is protected in the most susceptible places, namely, the bored holes and the surface in contact with the rails, since the oil is pressed mechanically into the heartwood in the bored holes, even though it be only a matter of a few millimeters and by the adzing a perfectly smooth surface is provided for the tie plates so that adzing after impregnation is obviated.

Another point to be observed more hereafter than has been done in recent years is the quality of the tie timber. The excellent protection from decay by impregnation has in many cases had the effect that the requirements with reference to the untreated ties have been overlooked. In Denmark, pine ties from Riga were used before the war, usually of very small diameter and frequently from the very soft coast pine. The excellent results, especially from three railways, are intimately due certainly to the fact that these roads required and received genuine Pomeranian pine ties. Most of the Danish railways have in the course of years had such heavy traffic that they require rather larger ties than



Renewal Curves for Treated and Untreated Pine Ties in the Danish State and Private Railways

Curve 1—Odense Kerteminde Railway originally built with 47,000 untreated Swedish pine ties. Renewals made with treated pine ties.
Curve 2—Average renewals of impregnated pine ties and some beech ties in the Danish State Railways during the period 1889 to 1926.
Curve 3—Pine ties in the Danish State Railways treated with coal tar creosote by the Rüping process.
Curve 4—Horsens-Odder Railway.
Curve 5—Thisted-Fjerritslev Railway.
Curve 6—Naestved-Praestö Railway.
Curve 7—Varde-Nörre-Nebe Railway.
Curve 8—Ringe-Nyborg Railway.

which favorable results have been secured for the ten-year interval, although this period is too short to permit definite conclusions to be drawn. The results which have been obtained from treatment in that country up to this time were presented by A. Collstrop of Denmark in an article that appeared in the Railway Age of July

formerly and the small ties will certainly be disappointing in many cases; for if a tie is in the first instance mechanically unfit it is futile to believe that it might have lasted for years.

So-called "insect-killed" wood has also caused considerable trouble. The extensive killing of timber in forest stands by pine beetle larvae has resulted in the killing of immense stretches of forest in Germany. The timber therefrom was thrown on the market in great quantities and found its way abroad. This class of timber may appear bright or smooth and sound and only after some time may assume the characteristically colored or faded appearance. Such wood cannot be penetrated satisfactorily in the sapwood. Both in Germany and in Denmark attempts have been made to counteract the injurious consequences of the attacks by the insect larvae by an increase in the absorption of oil; but any knowledge in regard to this matter is still wanting and I doubt that any valuable information can be gained in this way.

The Danish State Railways

Ties for the Danish State Railways were first impregnated in 1889 at the treating plant at Kjöge. These ties were laid exclusively in the tracks of the Island of Zealand roads in Denmark. Since then, 36 years of railway traffic in that part of Denmark has passed and the renewal figures prove that nearly 100 per cent of the ties in the tracks the first two years of this period have been replaced. We cannot figure more closely statistically, mainly for the reason that a number of these very old ties, through lapse of years, have lost the year numbers marked on them. I am of the opinion, however, that it has taken fully 35 to 36 years to renew these fir ties impregnated with a mixture of zinc chloride and coal tar creosote. In this connection it should be kept in mind that the renewed figures include also the ties renewed on account of mechanical wear.

It will be of greatest interest in the coming years to observe the results of impregnation with creosote by the Rueping process. The Danish State Railways adopted oil impregnation exclusively in 1908 and when the statistical data from the years following thereupon are summarized a preliminary result is thus obtained for the first 18 years, and these compared with the results of mixed impregnation appear as follows:

Length of service Years	Renewals: Oil treated ties. Per cent	Renewals: Mixture treated ties. Per cent
7	0.4	0.6
8	0.5	1.0
9	0.7	1.6
10	1.0	2.3
11	1.4	3.4
12	1.9	4.5 to 5.4
13	2.8	5.8 to 7.8
14	3.9	6.9 to 8.1
15	5.4	9.2 to 12.6
16	6.8	11.6 to 16.3
17	9.4	14.4 to 22.0
18	12.6	17.2 to 25.2

It is to be observed that the renewal of ties impregnated with the mixture is 50 to 100 per cent higher than of ties impregnated with creosote.

On the attached graph there is drawn for the Danish State Railways a curve for the average renewals in 36 years, representing the result for ties impregnated with a mixture of zinc chloride and coal tar creosote; and another curve for the last 18 years for ties impregnated with creosote oil. It is the latter curve that is to be followed in the years to come.

The renewal of ties for general maintenance on the Danish State Railways, in proportion to the number of ties in track for the last ten years is as follows:

1916-17	3.11 per cent
1917-18	2.50 per cent
1918-19	2.26 per cent
1919-20	2.48 per cent
1920-21	3.43 per cent
1921-22	3.66 per cent
1922-23	3.16 per cent
1923-24	2.87 per cent
1924-25	2.81 per cent
1925-26	2.29 per cent

This amounts, on the average, to three per cent annually.

In addition to the records for the Danish railways as a whole, more specific information is available for certain roads. On the Slangerup Railway, which was opened for traffic on April 20, 1906, 53,700 13 cm. by 20 cm. (5.1 in. by 7.9 in.) Pomeranian pine ties were laid after impregnation with zinc chloride and creosote, of which only 6.5 per cent have been removed after 21 years' service. On the Hornbaeck Railway, which was placed in service in the same year and in which 18,300 13 cm. by 20 cm. (5.1 in. by 7.9 in.) Pomeranian pine ties were used after receiving the same treatment, 27 per cent have been removed after 21 years' service.

On the Naestved-Praestö Railway, which was opened for traffic on March 20, 1900, 22,344 6¼ in. by 8¼ in. Swedish pine ties were used after treatment with zinc chloride and creosote, of which about 30 per cent have been renewed after 26 years' service. The Ringe-Nybord Railway was opened for traffic on September 21, 1897. This line was originally laid with 49,000 5-in. by 10-in. sawed Danzig pine ties treated with zinc chloride and creosote, of which 24 per cent have been removed after 29 years.

On the Odense-Nörre Broby Railway, which was opened on October 3, 1906, only three per cent of the 75,000 15 cm. by 20 cm. (5.9 in. by 7.9 in.) Pomeranian pine ties treated with zinc chloride and creosote have been removed after 20 years, while on the Horsens-Odder Railway, which was placed in service in 1904, 31 per cent of the 48,500 13 cm. by 20 cm. (5.1 in. by 7.9 in.) Pomeranian pine ties treated with zinc chloride and creosote have been removed after 22 years' service, and only 22 per cent of 77,700 ties of the same kind have been removed from the Thisted-Fjerritslev Railway, after the same interval.

Experience with Treated Poles

In co-operation with the State Telegraph Administration, we provided an experimental pole line three years ago in which poles impregnated in different ways, are arranged for comparison. By infecting the soil we secured conditions favorable for decay. When definite results can be secured more detailed reports concerning this test will be forthcoming.

Several private railways have used impregnated poles but sufficient data, to utilize statistically, are not yet available. At the time the following named railway lines were constructed, creosoted pine poles were set as follows:

Stubbeköbing-Nysted Ry., built 1910	1,000 poles
Ryomgaard-Gjerrild Ry., built 1911	550 poles
Ringkobing-Ornhöj Ry., built 1911	670 poles
Total	2,220 poles

Of these 2,220 poles, not one has been removed in the 16 or 17 years since they were placed. In 1917, the Troldhede-Kolding-Vejen lines received about 1,800 creosoted pine poles, of which only one has been replaced, probably because it was attacked by decay before treatment.

Annual Short Line Meeting

Problems of short or weak carriers considered at Washington convention

WASHINGTON, D. C.

THE annual meeting of the American Short Line Railroad Association was held at Washington on December 8 and 9, with the usual large attendance of officers of short line railroads from all parts of the country. Much of the discussion at the meeting was devoted to problems confronting the short lines in connection with proposed railway legislation and cases pending before the Interstate Commerce Commission.

Resolutions were adopted favoring continuation of the Pullman surcharge as representing "only a fair and reasonable charge for de luxe service," a reduction of federal taxes, and comprehensive flood control legislation. An amendment to the constitution and by-laws was adopted under which any Class I railroad "suffering from want of an adequate return" and therefore having a common interest with many of the short lines, may be admitted to membership in the association.

President Bird M. Robinson presided and opened the meeting with his annual report, in which he reviewed the railroad situation with particular reference to matters affecting the short lines, saying in part:

The attitude of certain departments of the government towards the rail carriers challenges the attention and interest, not only of the carriers themselves, but the public as well.

Prior to the World War, we heard much about government ownership of railroads, and a most promising picture was presented by its advocates.

The experience of the public during the time the government operated the railroads, was so unsatisfactory that we have heard little of that proposition since that time; this for the reason that open or direct effort to have the government acquire and operate the roads would meet with overwhelming defeat.

Notwithstanding that fact, efforts are being made and action taken by representatives of the government, which if successful, will lead inevitably to government ownership and probably operation.

If the policy of the commission to hold down valuations, because larger values would entail higher rates; if rates are to be reduced on certain kinds of traffic because the producers thereof are more or less in bad condition, and if the Post Office Department is to continue to take what it wants of the traffic of the carriers, at reduced rates, and succeeds in its demands for "unusually low rates" for services rendered it, conditions will inevitably go from bad to worse. When that time arrives the plan suggested by Commissioner Eastman may be the only alternative to both government ownership and operation.

Recapture Bill

Senator Pittman of Nevada, introduced in the Senate, during the last Congress, a bill to amend section 15-a of the act to regulate commerce, for the purpose of relieving certain classes of railroads therein defined, from recapture of any part of their earnings.

Immediately following the adjournment of our last meeting, that bill was very carefully considered by a committee of interested members. It was found impracticable to make provisions to exempt all of the member roads that desired to be included. An earnest effort was made to so frame amendments to the pending bill, that would exempt such members as were confronted by conditions which would differentiate them from others, in a way and to the extent, of demonstrating that the recapture of any part of their earnings would work a hardship or be a great injustice.

The chairman of the Senate Committee appointed a sub-committee to consider that bill. That sub-committee proceeded promptly to hold hearings, at which time the officers of the association, and a number of interested members, testified in favor of the bill. As a result of the showing made and the discussion by members of the sub-committee, we prepared and submitted to Senator Pittman, amendments intended to aid as many short lines as possible, and the sub-committee accepted most of such proposed amendments. Following that fourteen of the eighteen members of the full committee signed a favorable report to the Senate.

Owing to the fact that that session of Congress was a short one, that many important matters, especially the appropriation bills, had to be acted upon, the Pittman bill was not considered by the Senate.

Representative Newton of Minnesota, introduced in the House, at our request, a bill identical with the Pittman bill, as reported by the Senate committee. That bill was referred to its committee on interstate and foreign commerce, but that committee took no action with respect to it, probably for the reason it was then late in the session.

Senator Pittman has advised us that he will promptly re-introduce his bill at this session. We expect that Representative Newton will re-introduce it in the House, and it is our intention to press vigorously to secure its enactment.

While that bill, as drawn, would exempt only about 140 short lines, we hope and expect to have it amended so as to change the test period, now provided by law, for determining the amount of funds to be recaptured. The present one-year period is beyond question an unfair one. It enables the government to recapture the excess during good years and leaves the roads to take the losses in poor years. There are many instances where the roads in question, earned little or nothing during one or more years preceding a year in which they earned, as the result of some extraordinary condition, an unusual amount, and in the following year, their earnings dropped back to normal.

We will make every effort to secure a change in that test period so as to make it a minimum of three years, and we hope to have it made five years. If the test period can be made either three or five years, it will relieve, to a material extent, all carriers that are at any time subject to recapture of a part of their earnings, and in this respect we feel that any change in the test period, should be made retroactive.

We find, after extended efforts, that the public, as such, has ceased to be actively interested in the enactment of either the consolidation or our recapture bill; hence, we fear that Congress may not act on either at this session. If it should fail to act, it will—as we believe—be seriously detrimental to the interest of both the public and the carriers; this for the reason that the present uncertainty with respect to the future of a large number of the carriers would continue until the meeting

of Congress in 1929, as there is little hope of being able to secure the enactment of any important railroad legislation during the short session, which will begin in December, 1928.

The rate-making provisions of Section 15-a of the Commerce Act have been more misunderstood, and more extensively misrepresented, than any part of any law of which I have knowledge, and we are advised and believe that an active effort to repeal that part of Section 15-a will be made.

It is altogether possible that if any bill amending the Transportation Act, is enacted, it may repeal that section in whole or in part. Many of the advocates of the repeal of the rate-making provisions of that section, favor retaining its recapture provisions.

We are of the opinion that the repeal of the provisions for rate-making, would be seriously detrimental to the interest of all carriers, and will, to the extent we can, show Congress that fact.

No doubt a large number of bills of various kinds, intended to affect the railroads, will be introduced; some of them may be very objectionable, and it is altogether probable that we will have to become very active in the work of protecting our members from any adverse action.

Efforts have been made by different trunk line railroads, within the past two years, to obtain from the Interstate Commerce Commission, its authority to merge the properties of such major carriers under the provisions of paragraph (2) of Section 5, of the Interstate Commerce Act. That paragraph, in my opinion, ought to be considered and interpreted, in connection with the other paragraphs of Section 5, and particularly with paragraph (4) of that section, which requires the commission, as soon as practicable, to adopt a plan for the consolidation of the railway properties of continental United States, into a limited number of systems.

When considered in connection with paragraph (4) and those that follow, paragraph (2), under which the carriers are attempting to merge, was obviously intended by Congress to be used in harmony with the other paragraphs, and to promote and carry out the policy of forming the railroad properties into a limited number of systems. Paragraph (2) authorizes the acquisition by one carrier, of the control of another carrier or carriers, by lease or through purchase of stock, whenever the commission is of opinion, after hearing, that such acquisition will be in the public interest, and in the order approving such acquisition, the commission may prescribe such rules and regulations, and such terms and conditions, as it may find to be just and reasonable in the premises.

We have always contended, and still contend, that any order approving the acquisition of properties of one carrier by another, under the provisions of paragraph (2), cannot be in the public interest, unless the commission is satisfied that the proposed merger is in harmony with and furtherance of the policy clearly set forth in paragraph (4). It is obvious that if the major carriers can combine their properties, under the provisions of paragraph (2), without also combining short and weak railroads that ought to be included in the system proposed, then the very purpose of Congress will have been defeated.

Notwithstanding the inclusion of short and weak lines was one of the compelling reasons that induced Congress to set aside the anti-trust laws in order to promote such consolidations, the parties seeking approval of the commission in all cases so far presented, have not only made no provision for the inclusion of that class of roads, but have ignored them altogether.

The association having secured the provisions in the law, participated in the Nickel Plate and Kansas City Southern—Missouri-Kansas-Texas—St. Louis Southwestern applications, and having obtained definite recognition of the status adjudicated by the commission in the Nickel Plate case, we have not actively participated in the subsequent cases but have kept fully informed and ready to again take a hand, if it seemed necessary or desirable that we should do so. Member lines have been kept fully informed in every instance and have received advice as to how they should proceed for the protection of their own individual lines, and the public dependent upon them.

This was followed by a report by Ben B. Cain, vice-president and general counsel, reviewing the work of the legal department and the status of pending cases of interest to members of the association.

At the afternoon session the meeting was addressed by Chairman John J. Esch of the Interstate Commerce Commission and C. F. Staples, director of its Bureau of Valuation. An article regarding Mr. Staples' announcement of the commission's tentative plans for bringing railway valuations down to date appears elsewhere.

Chairman Esch Outlines Work of I. C. C.

Chairman Esch outlined the work of the commission, pointing out that it administers 28 separate acts of Congress and that its organization has grown in 40 years from five commissioners and 30 employees to eleven commissioners and 1,800 to 1,900 employees, approximately half of which are in the field and one-half in Washington.

The commission has not been able to keep abreast of the inflow of new cases, Mr. Esch said, and although in the past year it has handled 1,546 formal proceedings it has 2,800 cases pending. The "throat of the bottle" is the Bureau of Formal Cases, but with an increased appropriation recommended for next year it is hoped to increase the number of examiners and consequently the output so as to reduce the number of pending cases.

In the seven years since he became a member, Mr. Esch said, its output of volumes of decisions has been as great as it was in the 33 years preceding and for this year will amount to about 16 volumes, on the basis of an average of 750 pages to a volume. The Bureau of Informal Cases also handles some 10,000 informal cases a year.

Referring to the settlements with the railroads under sections 204 and 209 of the Transportation Act, Mr. Esch said that the commission is about closing up the inheritance which has come to the commission as the result of federal control.

The annual dinner on December 8 was attended by Commissioners Esch, Campbell and McManamy of the Interstate Commerce Commission and several members of Congress. James S. Parker, chairman of the House committee on interstate and foreign commerce, gave an address advocating the enactment of legislation providing for voluntary consolidation of the railroads, as contemplated in a bill he has introduced. Lieutenant D. M. Reeves of the War Plans division of the office of the Chief of the Air Service, U. S. Army, gave a talk on commercial aviation, illustrated by moving pictures.

"I do not believe," said Mr. Parker, "that consolidation of railways is the panacea for all ills of transportation. I do believe, however, that it will prove to be a very decided step in the right direction. I am thoroughly convinced in my own mind that consolidation with the proper safeguards is very decidedly in the public interest, and I shall use every endeavor to try and pass a consolidation bill for voluntary consolidation, where it is thought this consolidation is in the interests of the

public. The policy of consolidation that appeals to me as being the only one that we can put into effect is absolute voluntary consolidation. The interest of the public is always safeguarded, for before any consolidation is entered into, the Interstate Commerce Commission must find that the consolidation is in the interests of the public.

"It is generally recognized that a railroad system must be in a sound financial condition to give the public the service to which the public is entitled. The object of consolidation is not primarily to put the railroads in a sound financial condition; we are only interested insofar as their financial condition is reflected in the service they render to the public. We are not interested in the creation of large, gigantic systems. We are simply interested in the development of systems that will give the public the best possible system of transportation at the lowest possible rates. As I have said before, the primary object of consolidation is the interest of the public.

"Any system of consolidation must include the preservation of the weak or short lines that are necessary to serve the public. Weak and short lines in a vast majority of cases do not furnish the service to which the public is entitled, simply and solely because they are financially weak. Weak and short lines must be tied into strong systems where the service will be what the public have a right to expect.

"I am of the opinion that very great economy will result from proper consolidation. There is a difference of opinion as to how much the saving in overhead will be offset by increased cost of operation due to the lower wages of the weak and short lines. I believe, however, that the economy that will be possible will show a very substantial saving. It will be possible to get greater and more continuous use of the equipment, which will be a very great economy. Another great economy will be the ability to purchase in larger quantities for a whole system.

"There is no question but what the service rendered to the public will be very much improved by consolidation. These systems must be so arranged that they have a diversity of traffic so that earning capacity will be fairly stable, not entirely dependent upon one particular commodity.

"Another great advantage of consolidation will be the competition in service between systems that are comparatively of the same strength. One of the most important results in my judgment in consolidation is the simplification of government regulation. There are about 1,500 different companies operating railroads in this country and every single railroad has its own problems which must be threshed out with the Interstate Commerce Commission. If we have a small number of large systems, the task of regulation would be very much simplified and the public would be greatly benefited. Very many of the annoying discrepancies in rates which now exist would be wiped out.

"It is often impossible to perfect consolidations immediately on account of the inability to finance them. The sums involved are too large. I believe, however, that consolidations should be allowed to be started through the purchase, or lease, or in any manner that meets the approval of the Interstate Commerce Commission when that body is convinced that the ultimate object is a complete consolidation. In any legislation that is drawn care should be exercised to put such safeguards so that a repetition of the condition before the passage of the Sherman anti-trust law and the Clayton act will be impossible."

Members of the association were received by President Coolidge at the White House on December 9.

President Robinson, Vice-Presidents Ben B. Cain and L. S. Cass, and T. F. Whittelsey, secretary-treasurer, were re-elected. The meeting indicated a preference for holding the next annual convention at a point outside the United States but no definite place was chosen.

An English Locomotive and an American Train

The Great Western's "King George V" Which Appeared in the Baltimore & Ohio Centenary Exhibition, Shortly After the Exhibition Closed Made a Test Run from Baltimore to Philadelphia and to Washington with a Train of Seven B. & O. Steel Cars—Tender of Locomotive Was Equipped With Automatic Coupler and a Bell Was Mounted on the Head End.

How the Canadian National Developed a Water Supply*

Inadequate supplies and poor quality overcome by development of reservoirs in small coulees

By J. W. Porter
Special Engineer, Canadian National Railways, Winnipeg, Man.

DURING the first two decades of this century, railways were built throughout the prairie provinces of Canada at a rate never before equaled and many facilities (including water supplies) which are of extreme importance in railway operation were permitted to assume a temporary character in order that the energy and financial resources of the builders might be applied to the work of extending the lines into the rapidly developing country to serve the settlers who were coming into the country by hundreds of thousands. By the time this period of railway construction was slowing up, the world war came on and put an end to all development.

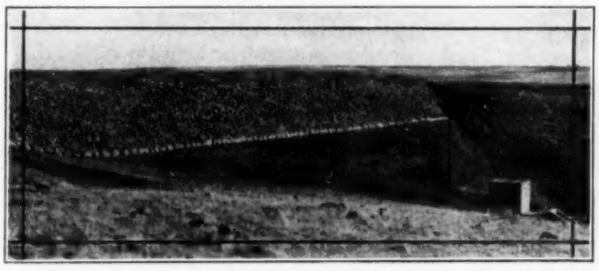
It was 1920 before the Canadian National System was able to give serious consideration to this problem of water supply betterment. Of course, during the period just mentioned the long stretches across the prairie had to be provided with water and where the lines were near enough to lakes or followed some of the river valleys, the solution was easy as they could generally be tapped at reasonable cost and the quality of the water, with a few exceptions, was suitable for boiler use. At other points on the bald prairies, shallow wells, deep wells and galleries were sunk, and while some of them proved satisfactory from the standpoints of both quality and quantity, many lacked one or the other of these virtues and some both. Where water was scarce, or lacking altogether, the water car had to be put into service. Where the quantity was sufficient but the quality bad, it was generally used, but a large percentage of the

Typical Dam Construction

operating revenues was consumed on account of frequent boiler washouts, flue repairs and renewals, not to mention increased fuel bills, loss of time in getting over the division and many other items of cost that follow in the wake of inferior water.

If owing to a shortage of water, say on a branch line, it is necessary to run water cars, their cost in a year has been stated as amounting to more than the interest depreciation and expense of operating two $20,000 water plants; therefore, the value of a continuous supply of good boiler water located at convenient points, as one of the greatest factors contributing to efficient operation cannot be stressed too greatly.

The ground water in western Manitoba, Saskatchewan and most of Alberta, while satisfactory for drinking



The Dam at Darmody

and culinary purposes, frequently leaves much to be desired as boiler water. Some waters are heavily charged with calcium or magnesium salts, forming a heavy scale, while others contain too much sodium salts, thereby causing foaming. Others again contain both incrusting and nonincrusting solids in large quantities and are unusable. There are very few locations favorable to good ground water supplies—that is, where the soil and sub-soil are of a fine sandy character and the district is one of ample precipitation.

Economic Considerations

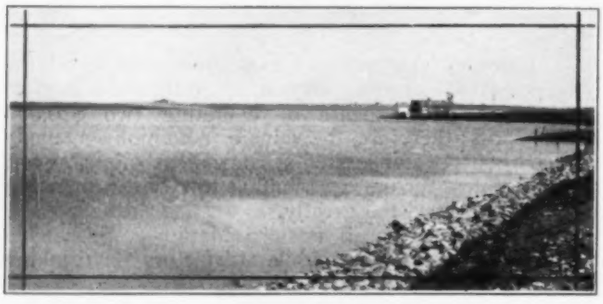
In making a study of water problems, economic conditions had, of course, to be taken into consideration. The principal products of western Canada are grain, cattle and coal and the larger proportion of these commodities, under present conditions, must be moved between September and January, inclusive. Hence, a water station must be able to produce from four to six times the daily requirements of the spring and summer. It was realized that the water at many points could be treated and brought to a satisfactory standard, but it was found impossible in most cases to increase the supply to take care of the heavy traffic period, which each year is becoming heavier. Sometimes a well would dry up and this would occur, as a rule, just when water was most required, hence this source of water supply was looked upon with suspicion.

A water supply, to be satisfactory, should (1) be depended upon to deliver enough water to take care of traffic at all periods and (2) produce water of a satisfactory quality or at least be amenable to treatment.

* From a paper presented before the convention of the American Railway Bridge and Building Association at Minneapolis, Minn., on October 19.

As the ground supply in most cases could not fulfill either of these requirements, it was decided to investigate the surface supplies. After careful consideration and investigation, it was decided to impound the spring run-off in various coulees that are so common in western Canada. As a rule there is a fairly heavy winter precipitation in the form of snow. This snow drifts into these coulees and ravines and produces an enormous run-off in the early spring while the ground is frozen.

Perhaps the most interesting feature that has been developed during the past seven years is the type of coulee used in which to impound water. Prior to 1920,



The Reservoir at Regina

many dams had been built in western Canada but most of these were on large coulees and ravines, where the discharge, if not continuous, could be depended upon to flow for a considerable part of the summer and occasionally again in the fall. Unfortunately, this type for the most part produced a poor quality of water owing to the fact that their beds were at or below ground water level.

After considerable field research work had been done, mostly measuring the early spring discharge of the smaller coulees, it was decided to use this type almost exclusively, where they were available, even where a considerable length of pipe line had to be laid to utilize them. Actual construction of this type of supply began in 1921 and to date we have completed 25 of these projects.

Before money was made available for any of these projects, it had to be demonstrated that there was a substantial economic advantage for each proposition and results have confirmed our figures. At Regina, for example, where our reservoir supply replaced city water, the annual saving is from $30,000 to $50,000. At Melville it is probably double this amount. At Raymore the plant paid for itself in three years, and at Scott in less than a year, and soon when our program is completed the total saving in operating costs will run into hundreds of thousands of dollars annually.

Quality Was a Primary Requisite

We have proceeded on the theory that a drainage area, to be satisfactory, must deliver enough water from the spring "run-off," after a winter of the lightest probable snowfall, to fill the reservoir. This point has been stretched in a few cases where a deep reservoir of large capacity in relation to probable consumption could be obtained. In such a case the reservoir when once filled will take care of from two to three years' consumption.

While our object was to get a large visible supply of usable water, the site that would impound the best quality was always used, often at a considerable increase in cost for the delivery pipe line. Where possible ravines were selected whose beds were above the ground water plane, thus preventing the seepage of inferior water with scale-forming or foaming tendencies.

In order to maintain the quality of the water in these reservoirs a scour pipe of suitable size is carried through in a trench in the natural ground under the dam. It is embedded in a slab of concrete and seepage checks are provided every 12 ft. for about two-thirds of the distance. A combined concrete valve chamber and well carried up through the dam controls this scour pipe. In the later dams control is in pumphouse. In the late winter before the run-off takes place, it is thereby possible to empty the reservoir and allow it to fill up again with new water in the early spring, thus preventing the concentration of soluble solids through evaporation. Pipes should never pass through the earth embankment.

Economical Arrangement

In several cases where the pumphouse is located below the dam the feed pipe is carried in the same trench as the scour pipe and embedded in the same concrete slab and turns into the pumphouse near the lower toe of the slope. This arrangement has proved very satisfactory as well as economical. In addition to the scour pipe at Rama and Conde, the quality of the water is maintained by by-passing the late flow in the spring and preventing the good water from being contaminated in the reservoir. At these points the ravines were at or slightly below the normal elevation of ground water. This resulted in the coulees discharging for a considerable period after the snow had all disappeared. When the discharge was small, the quality was very bad and when the discharge was large, the quality was comparatively good. A weir was constructed at the upper end of the reservoir and above this a foul water ditch was constructed which carried the water around the reservoir and returned it into the coulee below the main dam. The results obtained from this expedient were satisfactory as can be seen by the following comparisons of analyses:

	Foaming Solids Grains per Imp. Gal.	Incrusting Solids Lb. per 1000 Imp. Gal.
Rama, Sask.		
Reservoir	5.1	0.6
Foul water ditch	39.3	11.1
Conde, Sask.		
Reservoir	6.1	2.2
Foul water ditch	19.3	9.7

While gravity supplies in a prairie country are very uncommon, we were fortunate enough to locate one at Kipling and another at Avonlea. Although the head is low at both these points, (the former having a 35-ft. maximum and a 10-ft. minimum and the latter a 40-ft. maximum and a 25-ft. minimum) they are functioning satisfactorily.

These two were constructed in 1923. In both cases concrete headworks were constructed in the dam to control both scour and discharge pipes, while a float valve in the service tank controls the latter under normal conditions. We have just completed another reservoir at Dunblane with a capacity of 180,000,000 gal. and a head of nearly 100 ft.

Delivery pipe lines from reservoirs vary in length from a few hundred feet to seven and a half miles. Practically all of them are cast iron pipe from six to eight inches in diameter. Owing to the corrosive nature of the soil in the prairies it is not advisable to use wrought iron pipe. The Avonlea pipe line is a wood stave pipe 2½ miles in length and 6 in. in diameter. This, as previously mentioned, is a gravity line with low head and the soil is fairly free from corrosive salts, so it was considered an ideal location for this class of pipe.

The water impounded in these reservoirs amounts to nearly two billion imperial gallons.

A. S. M. E. Holds Winter Meeting

Railroad Division presents annual report of progress in railway mechanical field

OVER 2,400 registered as being in attendance at the annual meeting of the American Society of Mechanical Engineers which was held in the Engineering Societies building, New York, December 5 to 8, 1927, inclusive. Five papers and a report of progress in the railroad industry was presented by the Railroad Division at two sessions. A paper on Diesel Engines for Locomotives, by R. Hildebrand, chief engineer, Diesel department, Fulton Iron Works Company, St. Louis, Mo., was presented under the auspices of the Oil and Gas Power Division.

The report on the year's progress in railway mechanical engineering was read by the chairman of the division, H. B. Oatley, vice-president, The Superheater Company, New York. In compiling data for this report, the committed obtained information concerning developments in Europe as well as in the United States and Canada. Following are brief summaries of the report of progress in railway mechanical engineering and of other papers.

Progress in Railway Mechanical Engineering

During the past year the progress in railway mechanical engineering has been steadily toward bettering the operating efficiency of railroads by continuing the effort to increase the gross ton-miles per freight train-hour. Part of the accomplishment is due to heavier and more efficient motive power, part to improvements in signaling, heavier car loading, etc. The tendency toward higher steam pressures in locomotive boilers is going forward, the D. & H. having put in service its 400-lb. pressure 2-8-0 type locomotive, known as the John B. Jervis, and the Pennsylvania is engaged in designing a 2-10-0 type with 450-lb. pressure. Auxiliaries are operated with superheated steam; enlarged grate areas and greater firebox volumes are being used in increasing numbers, as are also feedwater heaters and exhaust steam injectors. Three-cylinder locomotives are being purchased in considerable numbers. Experiments are still being conducted with oil-electric locomotives in switching service. The Chicago & North Western has added storage batteries to reduce the weight of the primary power plant.

Indications from records covering the first half of 1927 encourage the belief that the fuel savings on locomotives will amount to approximately $17,000,000 as compared with the year 1926. The consumption per 1,000 gross ton-miles in freight service for the first four months of this year was less than for the corresponding period during the year 1926. If this rate of reduction is maintained, the 1927 figure will be 129 lb.

It is gratifying to note a more sympathetic and appreciative viewpoint on the part of the public toward the progressive efforts of the railroads. Greater efforts toward informing the general public of the engineering and operating progress made by the railroads is proving a wise move.

It was reported that radical changes were being considered by a number of technical schools in the courses of study offered to students in railway mechanical engineering. The fact was also brought out that some of the institutions formerly maintaining courses in railway mechanical engineering leading to the degree of bachelor of science, were abandoning this course and combining the more important railway subjects in the straight mechanical engineering course. It was suggested that institutions offering courses in mechanical engineering could present a better balanced course if the design and operation of motive power and rolling stock were included in the mechanical engineering curriculum.

Can Accident Prevention Be Reduced to a Science?

Thomas H. Carrow, superintendent of safety, Pennsylvania, Philadelphia, Pa., presented a paper on "Can Accident Prevention be Reduced to a Science?" Mr. Carrow in his title uses an interrogation point, but his conclusion after making an exhaustive analysis of causes, is that the answer should be in the affirmative. He cites the record of the railroads, as reported by the Interstate Commerce Commission, which shows the casualties per million man-hours, as having been reduced from 30.9 in the year 1923, to 20.7 in the first half of 1927; and, moreover, this progressive improvement is very much more impressive when the figures are shown with respect to individual railroads.

Besides the humanitarian aspect of preventing death and distress, the monetary result deserves attention. On a certain trunk line railroad, the cost of injuries to employees was reduced as shown by the following striking statement:

Year 1923.....	$327,657	Year 1925.....	133,057
Year 1924.....	185,297	Year 1926.....	82,470

Some accidents are, of course, unpreventable either by the management or the employee, and often it is not possible to determine whether the responsibility does or does not lie with the injured person. As showing how the individual character and habits of the man himself affect the record, the paper cites the accident records of eight men as follows:

1.	Car repairman injured.....	3	times in	26	years of service
2.	Car repairman injured.....	18	times in	9	years of service
3.	Machinist injured.....	0	time in	31	years of service
4.	Machinist injured.....	31	times in	23	years of service
5.	Freight conductor injured.....	1	time in	26	years of service
6.	Freight conductor injured.....	11	times in	20	years of service
7.	Locomotive engineer injured....	0	time in	26	years of service
8.	Locomotive engineer injured....	7	times in	33	years of service

Mr. Carrow estimates that 10 per cent of all injuries to employees may be classed as unpreventable, and five per cent as due to physical conditions, leaving 85 per cent which he charges to the human element. In a list of the advantages of accident prevention, he includes the forestalling of burdensome legislation, as one item; the public ultimately demands a reasonable standard of safety, if such is not voluntarily provided. One of the items under the head of cost is the expense of breaking in new men, which is estimated at from $50 to $250 per man.

Back Pressure and Cut-off Adjustment for the Locomotive

T. C. McBride, manager, locomotive feedwater heater department, Worthington Pump and Machinery Corporation, Philadelphia, Pa., presented a paper on back pressure and cut-off adjustment for the locomotive. He discussed the subject from the operating standpoint

only and gave data representing the indicated horsepower, the steam consumed and the dry coal fired as functions of the back pressure. He pointed out that for each locomotive there is a certain back pressure at which maximum power can be obtained at the lowest cost. He also proposed a method of determining the best back pressure experimentally and the use of back pressure gages for the guidance of locomotive enginemen.

Motor Truck and L. C. L. Freight

F. J. Scarr, The Scarr Transportation Service, New York, in discussing the motor truck and L.C.L. freight stated that transportation has advanced in economy and efficiency in proportion with the intelligent application of human ingenuity and capital investment. True advancement, however, is not in the development of any single phase to usurp in whole or in part the function to which any other phase is particularly adapted and better fitted to perform. A proper scheme of transportation demands that each means be employed in the task for which it is best suited.

The railroads, he said, are economically best suited for wholesale movement of freight. The controlling factor in their operation is terminal capacity and terminal costs and delays are the chief obstacles to their greater participation in the short-haul movement of less-than-carload traffic. Under the present methods and conditions, the highway operator can move most L.C.L. freight for considerable distances cheaper than the railways. He will continue to mantain an economic advantage for shorter terminal hauls but a new instrument of freight transportation, the unit freight container, will permit the profitable handling by rail of much of the traffic now trucked greater distances. This will necessarily result in the restoration of this traffic to the railways.

The container will use both the highway vehicle and the railroad in the portions of the total movement for which they are best fitted. The rail cost of less than one cent per ton-mile, or about one-seventh of the cost of movement by motor truck, will apply to the road-haul portion and the terminal cost will be decreased because of the elimination of at least four man-handlings of the freight.

In conclusion he stated that the most important collateral benefits are faster handling of freight from shipper to consignee, relief of terminal congestion, elimination of theft and damage claims, reduction in packing and carting costs, and reduction in rolling stock devoted to L.C.L. service.

Heating and Ventilating of Passenger Cars

Edward A. Russell, engineer of design, Vapor Car Heating Company, Chicago, Ill., presented a paper on the heating and ventilating of passenger cars. He set forth the essential requirements for ideal passenger car heating; namely, sufficient volume and pressure of steam supply from the locomotive for the adequate heating of every car in the train, full-area steam passage through the connections between the cars, with a minimum friction and freedom from leaks; and the correct amount, distribution and regulation of heating surface in each car to heat the car economically and satisfactorily under all conditions. The remaining portion of his paper was devoted to showing the need for larger steam hose, valves and car connections in long trains and then to a description of the automatically controlled vapor system of car heating.

S. Timoshenko, research laboratory, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., in discusing the vibration of bridges, said it is well known that a rolling load produces in a bridge or in a girder a greater deflection and hence greater stresses, than the same load acting statically. This impact effective of live loads on bridges is of great practical importance. He analysed in his paper the following kinds of impact—the live-load effect of a smoothly running load, impact effect of balance weights of locomotive driving wheels, and the impact effect due to irregularities. These irregularities include those in the track and also flat spots on the wheels. He showed that the live-load effect of a smoothly running load is small and can always be neglected. The impact effect of balance weights may be of considerable importance, especially under conditions of resonance and is most severe on bridges of the shortest span which will allow resonance conditions to occur. For the assumptions made in this paper, the minimum length of the span to allow such resonance was about 100 ft.

The impact effect due to irregularities of track may attain considerable magnitude in the case of short girders and rail bearers. By removing such discontinuities in the track as rail joints, a considerable decrease in impact stresses produced in bridge parts directly subjected to the dynamical effect of moving wheels can usually be accomplished.

Diesel Engines for Locomotives

The paper presented by the Oil and Gas Power Division on Diesel engines for locomotives by R. Hildebrand was devoted largely to a proposal by the author of improving the cylinders of the steam locomotive so that they may be used either as steam or Diesel cylinders or as both simultaneously, thus retaining the advantages of both types of engines. Mr. Hildebrand explained the working of such an engine and the conditions under which the various combinations of operation are to be used. He also showed typical indicator cards for steam, for Diesel and for combined operation. He said that the objections to the steam locomotive are made on grounds of inefficiency and that from 92 to 98 per cent of the heat in the coal is being wasted while the Diesel locomotive has an efficiency of about 33 per cent. The Diesel locomotive, he said, cannot be started under full load, cannot carry any overload without excessive pressures in temperatures and is so inflexible that an indirect drive or transmission is necessary.

On the P. R. R. in the Pennsylvania Coal Fields